DIET AND RACE

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DIET AND RACE

ANTHROPOLOGICAL ESSAYS

BY

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TO MY WIFE
FROM WHOM
I STOLE MANY HOURS
FOR THE PURPOSE
OF
THIS BOOK

PREFACE

The first two of these essays were written many years ago. They were to have been but two of a number dealing with the effect of diet on 'racial' characteristics. The type and volume of work which has fallen to my lot since then has made it quite impossible for me to continue on the lines laid out, and I cannct see much opportunity of doing so in the future. So I offer them to the public now, with the addition of some few pages on cranial form.

The first essay outlines a manner of approach to the question of relationship between diet and physique: the brief summary of the foods of different peoples with which it ends bears out, in respect of stature, the general truth of conclusions drawn *a priori*. The second essay, Diet and Colour, is fairly comprehensive: it is for the reader to judge if the case for associating colour with the salt content of the system is made out. That there is, at any rate, a case for further inquiry will, I think, be conceded: it should be an inquiry as to how far the presence of sodium chloride in the blood, by its effect on the mobility of the blood corpuscles, or in some other way, retards or prevents the deposit of pigment—an inquiry for the biological chemist. The last essay, Diet and Cranial Form, is suggestive only: again it is for the reader to draw his own conclusions.

It may be that the perusal of these pages will stimulate some one to exploit completely the field I have ventured to look into: such an occurrence would be sufficient justification for their publication.

F. P. A.

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DIET AND PHYSIQUE

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I

THERE are cases on record of men who have died after three or four days' fast; others, plentifully supplied with water, have endured for thirty and even for fifty days without taking food. And all the while their bodies gave forth heat. This heat resulted from the metabolism of muscular tissue and fat that provided energy necessary for vital processes. It is to make good the continuous breaking down of muscular tissue that food must be taken from time to time.

The substances in man's food which build up tissue and supply energy are those which contain nitrogen—proteid[1]; those which do not contain nitrogen—carbohydrates and fats; and those which supply mineral matter. These substances must be separated from the food consumed, and must be altered in composition or physical character before they can be assimilated. The disintegration necessarily preceding any such separation and chemical change is effected by the action of the jaws: saliva accelerates it and converts some of the starch into sugar. When the food has entered the stomach this change continues through the action of gastric juice, containing hydrochloric acid, and the ferment pepsin. Here, too, the connective tissue of flesh is rapidly affected and the proteid converted into soluble peptone. As the resulting thick greyish liquid—chyme—

[1] Protein is a general term for the nitrogenous matters found in the cells of animal and vegetable tissue. It is made up of proteids—bodies insoluble in water, like albumin, which after digestion take part in the building up of tissue—and non-proteids, bodies soluble in water and effective as foods only in so far as they yield energy by breaking down to carbonic acid and urea. Proteids constitute the principal solids of muscular tissue.

passes the lower entry to the stomach, a new and alkaline secretion, bile, mixes with it ; the acid of the gastric juice is neutralised, the pepsin is rendered inactive, fats are emulsified, and a ferment—trypsin—converts such starch and proteid matter as escaped the ptyalin of the saliva and the gastric secretion of the stomach into sugar and peptone respectively. The chyme passes through the colon to the rectum, whence such of the food as has escaped or defied the digestive juices is ejected.

Meanwhile there has been transference of peptones, sugar, water, and salts from the alimentary canal to the circulatory system of the body ; and the fats, reduced to finest globules, have been taken up in the stream of lymph which pours into the blood through the thoracic duct at the base of the jugular vein.

In addition to food the body requires air. The lungs are the seat of a combination between the oxygen of inspired air and the red colouring matter or hæmoglobin of the blood. With each contraction of the heart, blood thus oxygenated is propelled through the arteries, to return later by the veins charged with carbonic acid.

As a result of feeding, glycogen, a substance soluble in water and of the same composition as starch, is deposited in the muscular tissue and liver. This glycogen is the form in which the energy of sugar, and to some extent of proteid matter, is stored—for immediate use, in the muscles ; as a reserve supply, in the liver. In the course of time the connective tissue generally is loaded more or less with fat.

Carbonic acid is evolved from muscle in the normal state, and the quantity of this carbonic acid is much increased if the muscle contracts. Little is known concerning the manner in which the peptones absorbed by the blood build up tissue, but this evolution of carbonic acid seems to imply that there is in the muscle, or the muscle is itself, a substance loosely compounded of carbonaceous matter, oxygen, and modified proteid, which on breaking down yields the carbonic acid and nitrogenous substances, which later are eliminated by the lungs and kidneys respectively.

As fasting proceeds, the output of urea becomes almost constant, corresponding then to 33 grams of proteid ; but at the approach of death it suddenly increases. For body fat now is exhausted, and the energy hitherto supplied by its change is supplied by the break-down of muscular tissue. The normal protein change continues. Death is near. The loss of nitrogenous tissue, before this last stage is reached, is approximately 1 per cent. of the living protoplasm.

It is only in exceptional cases and when the body is at rest that the protein metabolism is reduced to that minimum which is indispensable to the maintenance of life. When the muscles are doing work, the intra-cell change is accelerated, and therefore more protein breaks down than corresponds with the minimum fasting metabolism. Carbohydrates and fats protect the tissue somewhat : a liberal allowance of the former will save 9 per cent. of the protein metabolism, of the latter 7 per cent.

With light work, protein may be stored as muscular tissue ; it may be stored unchanged also to meet the special demands of prolonged exertion. On such occasions the loss of muscular glycogen, being more rapid than can be made good immediately, is met by a call on ' muscular protein.' The pedestrian Weston, walking 62 miles per day for five days in succession, consumed each day 79·2 grams of protein, and lost 110·4 grams ; during each of the succeeding five rest days he consumed 171·6 grams of protein and gained 26·4 grams. Loss : $5 \times 110{\cdot}4 - 5 \times 79{\cdot}2 = 156$; gain : $5 \times 26{\cdot}4 = 132$.

Work requires energy. There is no such phenomenon as destruction of energy : if work is done, its equivalent in energy appears ultimately in the form of heat. Maintenance of life depends on the performance of work by the animal system : blood and lymph are driven through the vessels ; there is transfusion and osmosis of digested foods ; there is constant stress of muscular tissue ; energy is absorbed in building up protoplasm from proteid matter and glycogen. The necessary energy for these processes is supplied to the system through the agency of food, and is quantitatively estimable in terms of animal heat. If the

muscles perform external work, more energy is required and more food must be consumed.

The total amount of heat liberated by transformation of one substance into another or others is independent of any intermediate transformation through which the substance may have passed. If, therefore, we subtract the quantity of heat evolved on burning the waste matters of the body from that evolved on burning the food consumed, we have the amount of heat energy whose equivalent is applicable to the uses of the body. Such may be called the metabolisable energy of this food.

All that energy which is potential in the animal body, and which is not exhibited in the performance of external work, appears finally in the form of heat. It is obvious that the amount of heat to be eliminated from the body must depend on the amount of chemical change occurring there. The temperature and dryness of the air affect nearly this elimination—whether it be direct by radiation, or indirect, latent in water vapour—and both are variable. The metabolism of the body alters accordingly, till the 'critical' temperature, 15° C. or 59° F. for man in ordinary clothing, is reached. *Above* the critical temperature, equilibrium between heat production and heat elimination is maintained, not by decreased metabolism in the body, but by more ready removal of the heat produced, by perspiration, casting off clothes, etc. It is probable that the extra heat which must be supplied *below* the critical temperature is provided by the process of digesting food. For it would appear that of the total metabolisable energy of food only 85 per cent. of that latent in absorbed proteid, 97·8 per cent. of that latent in fat, and 91 per cent. of that latent in carbohydrates is available for work inside and outside the organism.

Those quantities of food which can replace each other without affecting the supply of energy are said to be isodynamic: thus, in a moderate ration, 100 grams of fat are equivalent to the dry matter of 235 grams of lean meat, to 235 grams of sugar, and to 229 grams of starch. Starch and fat alone will suffice the energy needs of the body if

sufficient protein is present to preserve nitrogen equilibrium. We may consume more protein : it will be stored in the body as that extra muscular tissue which results from continued exertion, or as ' muscular ' protein ; or it will contribute its equivalent of energy by breaking down into urea and carbonic acid ; but it is not essential to the maintenance of the active body.

The quantity of water per cent. in the human body varies between the limits of 87 for a child and 70 for an elderly person ; and 5–6 per cent. of this water is eliminated daily in one form or another. The actual loss is considerable—in one case it was 2,253 grams while the body was resting, 2,959 when it was at work. Some 500 grams of this loss is made good by the oxidation of hydrogen in food ; the remainder must be supplied either directly, as drink, or indirectly in food. The volume taken has little and but a temporary effect on the volume of the blood. Starving animals when they are working often will not touch water ; the breaking down of tissue supplies what is wanted, and more than this increases proteid metabolism. Water aids the clearance of waste matter from the tissue.

Earthy matter and the animal substance collagen, intimately blended, constitute bone. Bone is porous, with blood and lymph channels ; its earthy part is made up of salts of calcium and magnesium. Of the 67 parts of mineral matter present in the solid bone, 56 are calcium phosphate, 11 are calcium carbonate, calcium chloride, and magnesium phosphate. If we include the bone ash, the mineral matter in the body constitutes 4·7 per cent. of its weight ; if we exclude bone ash, 1 per cent. The salts in muscular tissue are potassium phosphate (this in relatively great quantities), calcium and magnesium phosphates, and common salt ; the iron compound hæmoglobin is present in the blood. But though these quantities are relatively minute, they cannot be diminished without the gravest consequences.

Man, and herbivorous animals generally, will take sodium chloride as such ; the continuous loss of salts other than sodium chloride, through the urine, etc., is made good by the salts that naturally occur in food.

Beyond this, that lime is necessary for the production of bone, iron for hæmoglobin, and sodium chloride perhaps for the hydrochloric acid of the gastric juice, nothing is known with certainty regarding the functions of body salts.

Recapitulation

(1) *The sustenance of the body depends solely upon dissolved proteids, sugar, emulsified fats, salts, and water, conveyed by the blood.*[1]

(2) *The final products of animal metabolism are carbonic acid and water, voided by the lungs and skin, and urea—with other nitrogenous matters in relatively insignificant measure —mineral salts, and water, voided in the urine and sweat.*

(3) *Thirty-three grams is the irreducible minimum to the quantity of proteid which must be supplied in the average man's daily food. The supply must be increased in the event of the muscles doing work, and will reach a maximum when all the energy demanded by the system is supplied by its disruption. The presence of carbohydrates and fat will reduce considerably the proteid metabolism caused by muscular activity.*

(4) *Energy which is supplied to the body through the medium of food and which is not used up in performing external work is eliminated as heat. So long as sufficient protein is supplied to maintain nitrogen equilibrium, energy demands may be met, and are best met, by supplying fats or carbohydrates in isodynamic proportions.*

(5) *Unless certain salts, in certain proportions, are present in food, and in that form too in which they occur naturally—except sodium chloride and lime, which may be added as such—and unless these salts are present too in such quantities as will keep the salt content of the body at 1 per cent. of its total weight, the food will be inadequate for maintenance.*

[1] Since the above was written the existence of the so-called *vitamines* has been demonstrated. The first statement in the recapitulation should be amended accordingly. One vitamine—fat-soluble A—acts as a stimulus to the assimilation of food; the other—water-soluble B—acts as an anti-neuritic factor. Further analysis of the facts set down in the following pages may prove a fruitful exercise to one well learned in the subject of vitamines.

II

Man has the dentition and digestive machinery of an omnivore. He possesses, on the one hand, the incisors of a rodent, the molars of a plant eater, and the canines of a carnivore ; and, on the other, an alimentary canal of mean length, secreting gastric juice, to convert starch into sugar, pepsin to dissolve proteids, and pancreatic fluid to emulsify fats. But it is reasonable to suppose that in his earliest stage of development his diet was mainly vegetable. As he grew in cunning he fashioned weapons and became a hunter. The terrors of the plain grew less ; he must needs go there to find those animals whose sweet flesh he desired so much. But this hunting was often a seeking without a finding ; and man grew yet more cunning. He collected his game around him ; he domesticated them : he became pastoral. And the company of men grew : they must travel to find food for their flocks, and travel farther. They came to plains well watered and very fertile. Here was an end to migration : the ground was cultivated, it yielded richly and did not tire. Man became an agriculturist. Such may, or may not, have been the exact course of things : our concern for the moment is this, that man did at one time subsist, as some do now, on the spontaneous fruits of the earth ; that many did and do subsist in the main on flesh or fish ; that many did and do depend on the produce of their herds ; and finally that agriculture does assure to many a stable and more or less certain diet.

In this section the probable effects on human physique of flesh, fish, and other simple diets respectively are considered. Deductions as to these, made in the light of the principles already stated, will be compared later with facts as given by actual observers.

Flesh.—Experiments on man with a view to determining the amount of flesh that will serve him as a sole diet are inconclusive, so the amount is calculated, and from three distinct sets of data :

(i) Average values from the daily dietaries of well-fed working men are : proteid 109 grams, fat 53 grams, carbohydrates, 450 grams. Accepting as isodynamic quantities, fat 100, extracted meat 225, starch 232, this diet is equivalent to 664 grams of extracted meat. These 664 grams of extracted meat are equivalent to 3,320 grams of fresh muscular tissue.

(ii) The fasting metabolism of man is productive of 32·1 calories for every kilogram of body weight. One gram of anhydrous lean meat yields 4 calories. A man of 11 stone weight would require, therefore, only 2,678 grams of fresh protein to sustain the energy output were there no increased metabolism due to feeding. But it is found that there is a very marked increase caused by the consumption of proteid food : in the case of a dog this amounted to 16 per cent. of the food taken. If we allow a corresponding increase in the metabolism of man, the flesh he must consume to sustain life will weigh 3,106 grams.

(iii) A dog weighing 30 kilos will maintain its weight when fed on 1,500 grams of lean meat per day. The metabolism of animals is proportional to the surface areas of their bodies. These, in the cases of a dog weighing 30 kilos, and of a man weighing 11 stone, respectively, are in the proportion of 1 : 1·93 ; to sustain his weight the man must therefore consume 2,895 grams of flesh food.

In making these calculations it has been assumed that the energy values of proteid and extracted lean meat are identical, that the metabolisms in men and dogs fed similarly are quantitatively in the same proportion as their masses, that these metabolisms, too, are exactly proportional to the surface areas of men and dogs respectively ; but the results, 3,320, 3,106, 2,895, are passably concordant, and their average, 3,107 grams, probably represents fairly the weight of flesh that would sustain an adult man doing some work. For the first value represents the flesh equivalent of the dietary of a worker, the last two of men doing nothing. Ross states that a Canadian boatman, when he has no other food, stipulates for 8 lb. (3,636 grams) of flesh food per day.

Fat.—While, however, 15 per cent. of the metabolisable

energy of proteid is lost in the work of its digestion, only 2·2 per cent. is lost when fat is digested. Naturally, then, the body of man will earnestly crave fat if he subsists on an animal diet. 'So much is buffalo meat preferred to all other,' says Catlin, 'that the deer, the antelope, and the elk sport in herds in the greatest security.' Musters found that among the Patagonians, in the absence of farinaceous food, fat became a necessary article of diet. The guanaco—excellent meat—is ignored unless the Indian wants blood, or ostriches are scarce; one man would kill five, six, or even eight guanaco, extract the young for food, and cast aside the carcasses of the mothers.

And there are other reasons why fat should be the dainty of hunting folk, whether living in high or low latitudes. In high latitudes the body will benefit much by a diet in which fat is substituted for some of the proteid in excess of the necessary minimum. Room will thus be found for sufficient food to meet the great loss of body heat in an arctic environment, the prolonged call on energy during the hunt, and the occasional scarcity of food. In Greenland a man will lie on his back and allow his wife to feed him with titbits of blubber and flesh until he is unable to move. And in low latitudes energy sufficient for the needs of the body will be supplied without that enormous consumption of flesh which, by its mere ingestion, causes considerable evolution of heat. In Africa and Asia—especially in the hottest parts—the people habitually eat enough clarified butter to satisfy an Eskimo. In Italy, Spain, and Greece general use is made of olive oil.

The carcass of a half-fat ox, with the bones removed, contains 22 per cent. of fat and 16·5 per cent. of protein. Salmon contains 12·72 per cent. of fat and 21·6 per cent. of protein. Under the skins of the whale and of the seal there is a thick layer of blubber. Calculation, based on the isodynamic weights of fat and proteid, shows us that for the 3,107 grams of pure proteid food there may be substituted 2,450 grams of meat from a half-fat ox.

The minimum proteid requirement of man—33 grams per diem—corresponds to 165 grams of flesh; flesh in

addition to that required to sustain proteid and energy equilibrium will therefore be available for muscular development and for storage of muscular protein. While the Canadian boatman referred to above, when his limited ration of food was cut short for two or three days, was 'exhausted and unstrung,' the Argentine Gauchos—who for months together touch nothing but beef—would pursue a party of Indians for three days without eating or drinking.

Flesh food is very perishable, so the hunter will tend to eat what he can and when he can: a Patagonian after two or three days' abstemiousness will consume at one meal 15–20 lb. of guanaco; on one occasion 'each man (Esquimaux) had eaten 14 lb. of raw salmon, and it was probably but a lunch after all'; 'a Yakut comforted himself with 20 lb. (9,090 grams) of frozen horse meat.' We shall expect those who live on an ample flesh diet, and particularly on a fat-flesh diet, to be a stout, well-limbed, energetic, and hardy people, whether they endure the cold of the north or dwell on the temperate and hot plains in lower latitudes.

Fish.—Fish may be divided dietetically into two classes —those which are fat, like the salmon and eel, and those which are lean, like the cod and shell-fish. Except for the water contents, the compositions of horse-flesh and of lean fish are much alike:

	Water	Protein	Fat	Salts
Horse . .	74·2	21·7	2·5	1·01
Cod . .	82·2	16·23	0·33	1·36

Moreover, the digestibilities of fish and flesh foods are *identical*. It follows, therefore, that what has been said above regarding a flesh diet will hold equally for a fish diet.

Where the means of subsistence are enduring there will

be accumulation of wealth according as there is exercise of forethought and diligence. Herdsmen will feed on the produce of their cattle, but not on flesh, unless the chance death of an animal summons to a feast. And their wealth and their numbers and their strength and their pride will tend to increase. But lands must be broad and well watered and enemies must be few if men will subsist on their herds alone ; a single drought, one successful incursion, would undo them otherwise.

Milk.—It is interesting to compare the compositions of the milk from three animals living such different lives as the mare, the ox, and the camel :

	Water	Protein	Fat	Sugar	Ash
Mare . .	90·8	1·99	1·21	5·67	0·35
Ox . .	87·17	3·55	3·69	4·88	0·71
Camel . .	86·57	4·00	3·07	5·6	0·77

The mare is a denizen of the vast steppes of Northern Europe, and is exposed during most of the year to extreme cold : her milk is rich, relatively to protein, in the heat producers fat and sugar. The ox inhabits warmer places : there is less demand for protection against external cold, and her milk is correspondingly poorer in fat and sugar. The camel is fitted for life on arid plains under a torrid sun : her milk is even less rich in non-nitrogenous ingredients. And as these different foods are well adapted for the young dependent on them, so are they suited to sustain the life of men living under the different conditions mentioned.

The metabolism of a man weighing 11 stone and receiving a mixed diet has an energy equivalent of 2,485 calories. To maintain his weight he would require daily 5·9 kilos of mare's milk, 3·7 kilos of cow's milk, or 3·7 kilos of camel's milk. In each case there is ample allowance of

protein, and sufficient fat and carbohydrate to permit of its adding to the bulk of muscular tissue. Those who are dependent on cattle for their subsistence will be men of bulk, exhibiting considerable stamina.

Grain.—Where life depends on agriculture, isolated activity is impossible ; and it is inevitable that a number of interdependent individuals, bound to a restricted area, will come in the early period of their corporate life under some hierarchy, monarchy, or oligarchy. The labour of the individual will be supervised and in a measure directed ; toll will be taken of the produce of his labour proportionate to its measure, and with thought for the means of his living. Among the hunter folk, until they learn the art of food preservation, all that is killed must be eaten, and at once. Among the pastorals the staples of life, if more certain, are almost equally perishable ; but grain and roots are stable—what is not eaten to-day will keep till to-morrow. There is opportunity for experiment : How little must a man eat to live and perform his labour ? He can measure his grain and learn by experience. Should he take too little, the supply is always at hand ; too much, he will remember to-morrow. If he consume less, his store will last the longer and his toil be diminished. The thoughtful and thrifty man will acquire the means of purchasing the labour of others. ' No point is better established,' says Ricardo, ' than that the supply of labourers will be always, ultimately, in proportion to the means of supplying them.' It is the possession of grain that allows full play to the elemental arrogance of man : he is no longer restricted in his wanderings by the pace of cattle, by barrenness of soil, or vastness of ocean. He carries with him food that can be protected from time or climate, and in what place he will he can settle, sowing his grain and reaping its increase. It will be from grain-eating peoples that we shall expect warring expeditions and maritime adventures.

Grain, whatever its kind, contains protein, fat, carbohydrates, and the elements of mineral salts ; but the proportions of these constituents are very various :

	Water	Protein	Fat	Carbo-hydrates	Ash	Cellu-lose
Wheat .	13·37	12·04	1·85	68·65	1·78	2·31
Oatmeal .	9·65	13·44	5·92	67·01	2·12	1·86
Rye . .	13·37	10·81	1·77	70·21	2·06	1·78
Maize .	13·35	9·45	4·29	69·33	1·29	2·29
Italian Millet	13·05	13·04	3·03	57·42	3·05	10·41
Sorghum (*vulg.*)	11·46	8·96	3·79	70·25	1·95	3·59
Rice . .	12·58	6·73	0·88	78·48	0·82	0·51

While flesh and milk foods are almost totally digested, and the carbohydrates of cereals also, there is a wastage of 16 per cent. or thereabouts of cereal protein. As effective foods, therefore, the cereals will contain more carbohydrates for the same amount of protein than appears from the above figures. These figures refer to corn ground fine, and with the bran removed. If the corn is eaten whole or only imperfectly ground, much more of the nutritive power will be lost, owing to protection of the grain substance by the external covering of insoluble cellulose. It is interesting to remember that while the digestive organs of vegetable feeders make up 15–20 per cent. of their body weight, this number falls to 7·8 per cent. in the case of man, and to 5·6 per cent. in the case of carnivores.

Wheat.—Wheat is probably indigenous in Mesopotamia. It is a grain which fares best in a temperate and fairly dry climate ; its reproductiveness varies greatly with the season and the skill directing cultivation.

By the consumption of 100 grams of wheat 321 calories are liberated in the body. The metabolism of the resting body during 24 hours produces 2,485 calories ; so to meet this loss there must be eaten 774 grams of wheat. And this supply of food contains 78·3 grams of available protein. The quantity of wheat food necessary to maintain energy equilibrium contains, therefore, more than sufficient protein to make good the waste of tissue (33 grams). Since any

additional food taken to support mechanical labour supplies further protein, and mechanical labour is just the condition under which excess of proteid is turned to muscular fibre, it is clear that a diet of wheat alone will suffice to supply great energy to a stoutly built frame. The critical temperature for man is 59° F.; above this temperature it is important that the body should receive sufficient protein without any excess of heat-giving material. It is in wheat among the cereals that we find this proportion of protein to carbohydrates and fat most nearly. Wheat, therefore, will be the staple diet in all those countries where it is grown. It has been said that the health and the mental and bodily vigour of the inhabitants of temperate climes are attributable to this food more than to any other single cause. Wheat was the staple of the most ancient peoples of Persia, Asia Minor, Egypt, and Greece. Hector's horses were fed with this grain.

But there must be one addition to a cereal diet. If we compare the percentage compositions of the ashes left after incineration of a mammal carcass and of wheat, we find a great deficiency of the elements of common salt, sodium and chlorine, in the latter relatively to the former, thus :

	Potash	Soda	Lime	Magnesia	Ferric Oxide	Phosphoric Acid	Sulphuric Acid	Silica	Chlorine
Flesh	37·04	10·14	2·42	3·23	0·44	41·2	0·98	0·69	4·66
Wheat	31·16	3·07	3·25	12·06	1·28	47·22	0·39	1·96	0·32

Rice.—Rice is indigenous in China; probably, too, in tropical Australia. It occurs in many forms, some the products of marshy alluvial plains, others of the dry fertile uplands. Its composition in parts per hundred is: 12·58 water, 6·73 protein, 0·88 fat, 78·48 carbohydrates, 0·51 cellulose, 0·82 ash. Of these parts, 5·15 of protein and 76 of carbohydrates are digestible.

The consumption of 100 grams of rice will supply energy equivalent to 332·6 calories; 750 grams, therefore, will

meet the daily demand of the body for 2,485 calories, and this quantity contains only 38·6 grams of available protein.

Swën, weighing 9 stone, found himself able to maintain nitrogen equilibrium with 28·25 grams of protein. A fasting man weighing 11·7 stone passed nitrogen in his urine equivalent to 33 grams of protein : this on the average for thirty days. Experiments on animals have shown that with plentiful carbohydrate supply the proteid metabolism can be reduced to that observed during fasting ; and it is possible, therefore, that the 38·6 grams of protein present in the minimum ration of rice may serve to make good the waste of muscular tissue. But it is evident that even with a supply of rice food exceeding somewhat 750 grams there will be little protein for the formation of surplus tissue.

The process of digestion is accompanied by an emission of heat, amounting in the case of carbohydrates to 9 per cent. of the metabolisable energy. In a hot climate it is necessary that any undue heating of the body be avoided, for the power of emitting this heat is limited. For this reason, and because women in hot climates are prolific, and the demands on the storehouse consequently great, there will be a tendency in rice countries to great economy of food. The protein supply will reach its lowest limit. Of the people in Ceylon, Pridham says : ' The ordinary diet is very meagre, consisting of rice seasoned with salt. . . . It is considered anything but a reproach to be sparing in diet, but rather a credit to live on hard fare and suffer hunger.' Is it not reasonable to suppose that such economy with such food, acting over immense spaces of time, will conduce to a shortening of stature and corresponding diminution of bulk ? Shall we not find rice eaters men of little energy and poor stamina ? Such, indeed, are the effects that have followed the feeding of animals with rice, even when considerable quantities of skim milk and potatoes have been added.

Maize.—Maize is indigenous in tropical America : frost kills it. The plant grows best in warm, rich soils, such as are found on the great prairies of the Mississippi basin. Of maize protein, 84·5 per cent. is digested, of the fat 82·5

per cent., of the carbohydrates 96·8 per cent.; 100 grams, then, of the cereal will yield to the body 7·98 grams of protein, 3·53 grams of fat, 53·4 grams of carbohydrates, and 0·85 grams of the elements of mineral salts, equivalent in energy to 284·5 calories; 873 grams of maize, containing nearly 70 grams of protein, will satisfy the body's demands for energy, and will maintain nitrogen equilibrium; the additional food taken to allow of mechanical labour will lead to the formation of further muscular tissue.

It is interesting to compare the amounts of heat produced by the acts of digesting these 873 grams of maize and an equivalent amount of rice — viz., 220·11 and 228·5 calories respectively. The former grain is a more suitable food in a hot climate than the latter. Where men, in a cooler climate, can feed more heavily with impunity, the considerable fat content of maize will lead to a storage of fat. We shall expect those who live on maize to be of muscular frame, whatever be the conditions under which they live; we shall expect, moreover, that those who enjoy a temperate climate will exhibit great energy and endurance. Horses which have been fed on this cereal are excellently conditioned and exhibit great power.

The ash of maize is very deficient in sodium: maize eaters will require much salt.

Sorghum vulgare—'Durra,' 'Guinea or Negro Corn,' 'Broom Corn,' 'Indian Millet or Juari' — has almost as wide a range as wheat, and is very prolific, sometimes yielding a hundredfold; it is indigenous in Central Africa. For 100 grams of sorghum eaten, 7·61 grams of protein, 3·41 grams of fat, 68·84 grams of carbohydrates, and 1·65 grams of the elements of mineral salts are digested; the energy equivalent is 345 calories. There will be required, then, 720 grams of sorghum to supply the energy necessary to the body at rest; these contain 54·72 grams of protein. This is much less than the quantity contained in the necessary ration of maize, 70 grams. The heat evolved by its ingestion, 221 calories, is rather greater than the corresponding amount for maize, 220·11. It is a food well suited to a hot climate, and will sustain a muscular frame. Barth, in West Africa,

could not eat it at first, but later found there was no other food which suited him so well.

Rye.—Rye is indigenous in the country lying between the Black Sea and the Caspian. It is very hardy, growing in the cold climate of Northern Europe and in Northern India. As a food it is very deficient in fat : 100 grams of the grain provide 1·28 grams of digestible fat, 7·35 grams of protein, 62·55 grams of carbohydrates, and 1·32 grams of the elements of mineral matter; 830 grams of rye will be required to furnish necessary energy to the body, and this quantity contains 61 grams of protein. The heat evolved on its ingestion is 230·8 calories, a number comparable with the 228·5 for rice. It is a food more suited to a cold than to a hot climate. We shall expect to find rye eaters muscular, enduring, and energetic ; and especially so if they inhabit the colder districts of Northern Europe, where there is no check imposed by climate upon the amount of food consumed.

Rye has long been classed as a ' hot ' food. It is the common cereal of the colder and middle lands of Europe—that is, of the Germans and Russian Slavs—indeed, in Germany, ' corn ' means rye.

Date, Cocoanut, and Manioc.—The following table gives some information respecting the date, the cocoanut, and ' farine,' a preparation of the manioc root. I have not found any information as to their respective digestibilities, and so have made the calculations on the supposition that protein, fat, and carbohydrates are all completely absorbed. This supposition is undoubtedly erroneous, but still the figures are worth consideration.

	Water	Protein	Fat	Carbo-hydrates	Cellulose	Mineral Matter	Heat of Ingestion
Date .	20·8	4·4	5·5	65·7	2·1	1·5	204
Cocoanut .	5·81	8·9	67·0	12·44	4·06	1·8	83
Manioc meal	11·8	1·16	..	79·19	...	..	..

	Equivalent in Cals. of 100 Grams	Quantity in Grams necessary to Maintain Energy Balance	Protein present in the Foregoing
Date . .	338·6	730	32·12
Cocoanut .	710·5	350	31·15
Manioc meal .	329·4	870	8·7

Were all the protein present in the form of proteid, and so useful in replacing metabolised tissue—and it is not—there would be little enough to maintain nitrogen equilibrium. However, it may be that on a diet of dates alone, with the extra quantity that must be consumed to supply energy for mechanical work, equilibrium may be attained, for the quantity of carbohydrates is relatively great; also that on cocoanuts alone, fat being a protector of protein, and digestible with little evolution of heat, there may be nitrogen equilibrium. But 'farine' is no food to be consumed as a sole diet. The 3,500 grams that would serve to maintain man's muscular tissue is a quantity too great for consumption in a hot climate. We shall expect, then, that date feeders will be of spare frame; dwellers in a hot climate, they will not consume readily abundance of a food whose digestion results in the evolution of so much heat as does the digestion of the date. Those who live on the cocoanut may well be men of bulk.

Potatoes.—Potatoes are indigenous in South America, and were imported into Europe about 1580 A.D. They contain the following ingredients in parts per cent.: water 74·93, protein 1·99, carbohydrates 20·86, fat 0·15, salts 1·09, cellulose 0·98; and of these there are digested: protein 1·35, starch 19·27, fat 0·15, salt 0·91; 2,900 grams of potatoes will be required, therefore, to produce the 2,485 calories lost each day by the body; these 2,900 grams contain 39·15 grams of protein. But the protein of potatoes is, much of it—35 to 56 per cent.—in a form that

is useless for tissue-building purposes. It requires much more than the quantity mentioned to sustain nitrogen equilibrium—so much more that the limit of consuming power is reached and only just sufficient protein assimilated. There will be no addition to the muscular tissue of the body, which will exhibit little stamina; on the other hand, the supply of carbohydrates will find energy for occasional and short-lived exuberance. Buckle, in his History, gives a man 4,320 grams as a daily ration.

Pulse—There is a Hindoo proverb, 'Rice is good, but lentils are my life.' The family of leguminous plants includes, among others, broad beans, kidney beans, peas, lentils, and the vetch. Their fruits—pulse—have compositions that are almost identical; in 100 parts the mean quantity of protein is 12·9, of fat 1·7, of carbohydrates 52·4, and of salt elements 3·0. And of these parts there are digested 10·64 parts of protein, 1·6 parts of fat, 50·51 parts of carbohydrates, and 2 parts of the salt elements. One hundred grams of pulse will thus supply energy to the body equivalent to 256·4 calories: 970 grams, containing 103·2 grams of protein, will be the necessary daily ration. The heat of ingestion of this quantity is 245 calories. It would seem, then, that in pulse we have everything necessary for the making of a man stout in physique, energetic and enduring. But pulse differs in this from the other food stuffs we have considered—it cannot be eaten unmixed for any length of time. It is the same with cattle as with man: mixed with other food, pulse is consumed with gladness, unmixed it rapidly causes loss of appetite and emaciation.

* * *

There does not appear cause why flesh or milk eaters should especially desire vegetable food; on the other hand, those who live on fruit, cereals, or roots will keenly desire flesh or pulse, for both of these are rich in protein and salt. Tennyson writes: 'I had gone without meat for six weeks, living only on vegetables; and at the end

of the time, when I came to eat a mutton chop, I shall never forget the sensation. I never felt such joy in my blood.' Notwithstanding an occasional taste of flesh, many an agriculturist must depend for his full supply of protein food on the less precarious products of the soil, whose culture is within his province, that is, on some form of pulse. His demand for oily substance may be better served by the fruit of trees than a hunter's is by the fat of animals. The Badawin who live on flesh, milk, and dates, deride the 'bean eater': Chilian miners, subsisting entirely on boiled beans and bread, carry up 200 lb. of mineral from a depth of 80 yards twelve times a day. They would prefer bread alone, but they are made to eat the beans because then they work better.

The following table summarises the numerical contents of the foregoing pages; 'weight in grams' refers to the quantities of single foodstuffs necessary to provide the energy—equivalent to 2,485 calories—on which the life of man depends during twenty-four hours.

Foodstuff	Weight in Grams	Protein	Fat	Carbo-hydrates	Heat of Ingestion in Calories
Lean meat .	3,107	620·0	..	..	381·9
Half-lean ox .	2,450	404·2	539·0	..	250·8
Wheat . .	774	78·3	14·3	531·3	235·6
Rice . .	750	38·6	6·6	570·0	228·5
Maize . .	873	70·0	30·4	464·6	220·11
Sorghum .	720	54·72	24·5	495·4	221·0
Rye . .	830	61·0	10·6	579·2	230·8
Cocoanut .	350	31·15	234·5	43·4	83·0
Potatoes .	2,900	17·6	4·3	559·7	217·5
Pulse . .	970	103·2	15·5	489·9	245·0

The average standard dietary for well-fed working men given on a previous page—if we allow that 97 per cent. of the protein, 95 per cent. of the fat, and 97 per cent. of the carbohydrates are digested—contains the following: 105·7 grams of protein, 50·3 grams of fat, 436·5 grams of carbo-

hydrates, equivalent in energy to 2,690 calories and with a heat of ingestion 236·3.

We may place mankind in the following categories: Consumers of flesh or fish, consumers of vegetable food rich in protein, as wheat or maize, of food poor in protein, as rice or potatoes, and finally of a food mixed of these with flesh or vegetable substance, rich in protein.

Those who live on flesh or fish, where such is readily obtainable, will be men of bulky frame and powerful muscle, capable of displaying great energy, and always very enduring; where such is scarce, the men, eking out their subsistence with chance fruits of the earth, will possess small frames to suit the environment, but again will display great energy and stamina. The perishable nature of their food will render them improvident and gregarious.

Those whose fare is wheat or some similarly constituted cereal will have a powerful, well-sized frame: their energy will be greater if their endurance be less than that of the foregoing: they will be the pioneers of the world, their food being stable during long journeys by sea and land. Rice eaters will be small men, of poor physique and feeble stamina: they will be thrifty and numerous.

The greatest bulk and muscular development will be associated with an ample mixed diet of flesh, fish or milk, and some form of grain or root.

There is one characteristic of man, seemingly associated with food supply, that has so much to do with the ordering of things now, has had in the past, and will again in the future, that some few lines here may be devoted to its consideration: I mean his pugnacity, ferocity, readiness or eagerness to contend—whatever be the term chosen. Allowing that this characteristic is more marked among carnivorous than herbivorous animals, are we to regard it as contingent on the eating of flesh, or rather as the disposition to obtain flesh? Liebig found that a bear, ordinarily quite harmless, became violent when fed on flesh; but this might imply merely that being for once restored to

vigorous condition, the bear found cause of grievous complaint in its confinement. It is true that lions, tigers, and similar creatures appear ferocious when seeking their prey or withstanding attempts on their lives. But are we right in calling this necessary taking of sustenance, or this instinct for self-preservation, ferocity? When fed and unmolested they are tame and peaceful enough. Is it because these beasts have capable weapons of offence that we call them savage? A hare when wounded will bite, and a brooding hen will peck. There is no reason to suppose that flesh-eating man as such will be less amenable to the pleasures of peaceful possession than fruit and grain eaters; but there is reason to suppose that wanting a thing he will be more ready than others to risk the dangers so often met in the hunting fields, armed as he is with weapons of proved efficiency. For him, moreover, as for the pastoral, there will be little of that terror of the unknown so potent with his stay-at-home congeners. These know little of combat with animate or inanimate nature and are little inured to pain; and peace is essential to their crops. Their activities will seldom lie in the direction of personal forceful acquisition. But chance it otherwise, fear of strife will vanish, and till the end be achieved there will be a display of pugnacity, ferocity, or delight to contend, only more intense than that shown by flesh-eaters, because more constantly sustained by certain food supply. 'The Romans,' says Mommsen, 'lost many battles; they scarcely ever, on making peace, ceded Roman soil, and for this they were indebted to the tenacity with which the farmers clung to their fields and homesteads.'

III

Rowntree, in his 'Poverty,' differentiates between the *primary* poverty of families whose total earnings were insufficient to attain the minimum necessaries for merely physical efficiency, and the 'secondary' poverty of those

families who, but for accessory expenditure, would be able to purchase sufficient.

He gives the following statistics for three working-class areas in the City of York, where there are living in a state of primary or secondary poverty 4,737, 3,679, and 0 persons respectively :

	Aver. Heights of Boys between 3 and 13 years	Aver. Weights of Boys between 3 and 13 years.	Deficiency or otherwise of Energy Value per head per day[1] (Standard = 3500 cals.)
Area I .	45¾	52½	— 814
„ II .	48½	55¼	+ 187
„ III .	49¼	58	+ 539

In the first years of the present century the minimum height for infantry of the line was 5 feet 3 inches, the minimum weight, 8 stone 3 lb. : of 88,402 men who offered themselves for recruitment in the United Kingdom—90 per cent. of these belonged to the working classes—9,317, or 11·1 per cent., were rejected on account of insufficient physical development.

'Stature,' says Keane, 'like the eyes, is more uniform amongst the lower than amongst the higher races, where it is chiefly affected by pursuits, town or country life, agricultural or industrial occupations in mines or factories, and so on. Hence there are not only tall and short Americans, such as the Patagonians and their Fuegian neighbours, but also tall and short Englishmen, and even tall and short Londoners, as is evident by comparing the East End population with those of "Club-land."'

[1] The fasting metabolism of man is productive of 32·1 calories for every kilogram of body weight; a man of 11 stone therefore has a fasting metabolism equivalent to 2,247 cals. (1 kilo = 2·2 lb. avoirdupois).

					calories
For man with	little	physical exertion,	fuel value of	necessary food is	2,700
„ „	light	„	„	„	3,000
„ „	moderate	„	„	„	3,500
„ „	active	„	„	„	4,500

'The Warori,' says Burton, 'are small and shrivelled black savages. Their diminutive size is, doubtless, the effect of scanty food continued through many generations. . . . The principal articles of diet are milk, meat . . . maize, holcus, and millet.'

The following notes suggest that low stature (under 1,600 m. or 63 inches) may be due to chronic insufficiency of food.

Nootkas (Harrison Lake)	5 ft. 2 in.; live on berries, etc.; fish and flesh food not common.
Aymara (Lake Titicaca)	5 ft. 3 in.; an extremely small allowance of food when the Indians of the Puna have to provide for themselves.
Guayaquils (forests north of the R. Parana)	4 ft. 11 in.; nomads living on fruits and flesh. Hide food in trees against the days of famine.
Lios (I. of Flores)	5 ft. 2 in.; 'savages.'
Kubus (forests of Sumatra)	5 ft. 2 in.; nomads, who eat as they come by it.
Besisis (S. extremity of Malay Peninsula)	5 ft. 1 in.; they do not often get the chance of eating to excess, except in the fruit season or at harvest time.
Semang and Sakai (hills and forests of Malay Peninsula)	4 ft. 11 in.; the aboriginal tribes of the Peninsula do not usually resort to hunting till their supply of vegetable food begins to give out and they begin to feel the pressure of want.
Jakun (Benua) (Malay Peninsula)	5 ft.; they would spend two months at the fruit season in the orchard, and for this purpose would travel 180 miles by sea.
Negritos of Zambales (W. Luzon)	4 ft. 9 in.; their life is a continual struggle for sufficient food. They maintain their half-starved lives by the fruits of the chase and by forest products.
St. Christoval (Solomon Is.)	5 ft. 3 in.; dearth of food.
Akka (forests of Upper Welle District, Africa)	4 ft. 6 in.; nomads, to whom any food is acceptable.

Bayayas (forests of Africa 11° long. E. of Paris, 2° lat. N.)	4 ft. 7 in.; savage nomads.
Hottentots . . .	5 ft. 3 in.; when in straits for food they will eat cast-off shoes.
Bushmen . . .	4 ft. 9 in.; hunger compels them to eat everything.
Lapps	5 ft.; against times of scarcity make bread from the inner bark of the pine-tree. Food often very poor and insufficient.
Andamans (jungle) .	4 ft. 11 in.; the fasting period (during which turtle, honey, pork, fish, yams, larvæ are not eaten) commences between the 11th and 13th year, and varies in length from 1 to 5 years. With women it does not terminate till some time after matrimony.
Papuans (New Guinea, from E. Cape to Astrolabe Bay)	5 ft. 2 in.; native festivity not infrequently accompanied by great privation, which chiefly affects the women.
Ostiaks (Ob Basin, northwards)	5 ft. 2 in.; they live on berries, game, and fish, and are very poor.
Kurumbas (mountains N. and S. of Arcot)	5 ft. 1 in.; they live on ragi, roots, and small yams, and often are hardly pressed by want.
Veddas (Ceylon) . .	5 ft. 1 in.; nomads. In times of scarcity consume rotten wood soaked in honey.
Annamites . . .	5 ft. 2 in.; the emaciated coolies eat two bowls of rice per day and demand only an hour for repose.
Laos (N. Siam and W. Tongking).	5 ft. 3 in.; rice and anything eatable. Improvident.
Chinwans (Formosan forests).	5 ft. 2 in.; nomads. They hate work, and often fast several days.

It will be noticed that all these short peoples inhabit inhospitable and therefore isolated districts; many are confined to relatively small islands. Whether it is in arctic, torrid or temperate climates, scarcity of food is associated with diminutive stature. 'The luxuriance of tropical vegetation,' says Wallace, 'is not favourable to

the production and support of animal life. The plains are always more thickly peopled than the forest; and a temperate zone seems better adapted to the support of large land animals than the tropics.'

There are a number of half-savage peoples in European and Asiatic Russia, living on the flesh and milk of their cattle, and such farinaceous and vegetable food as they may chance upon: the circumstances of their lives preclude superfluity. Again, certain of the wild tribes of Southern India have this in common, that they live largely on the produce of the jungle, small yams and carrion, fruits, wild vegetables, and grain—ragi or rice: their comprehensive menu suggests deficiency. The following are the peoples referred to and their statures:

Eur. and As. Russia:		India:	
Tungus	5·2	Kols	5·5
Chukchis	5·4	Bheels	5·3
Kamchadales	5·3	Kotas	5·4
Kalmuks	5·5	Irulas	5·1
Bashkirs	5·5	Badagas	5·5
Buriats	5·4	Wagadis	5·1
		Mikirs	5·4
Average	5·4	Average	5·3

In the following table there are brought together the average statures, in feet, of peoples in different countries living without stint on different types of diet. Figures under 'flesh,' 'maize,' 'rice,' refer to those whose diet, in the main—and sometimes almost exclusively—is flesh, fish or milk, maize or rice respectively. The data are given overleaf.

	Flesh	Flesh + Roots	Flesh + Roots + Cocoanut	Flesh + Grain (not Rice)	Flesh + Grain + Veg. Butter	Maize	Flesh + Manioc or Sago	Flesh + Manioc or Sago + Cocoanut	Rice	Rice + Flesh
America . .	(10) 5·6	(15) 5·7	..	(11) 5·8	..	(8) 5·6	(7) 5·3	..	..	..
Malaysia .	..	..	..	..	..	..	(4) 5·4	(3) 5·5	(12) 5·3	(3) 5·4
Australia and New Zealand	..	(11) 5·6	..	..	..	..	..	..	..	..
Polynesia .	..	..	(6) 5·8	..	..	..	..	..	..	..
Africa . .	..	..	..	(13) 5·8	(4) 5·9	..	..	..	..	..
Asia . .	..	..	..	(6) 5·7	..	..	..	..	(8) 5·3	(4) 5·4
Europe and Siberia. .	..	..	..	(11) 5·7	..	..	..	..	..	..

This table makes it clear that 'race' is of small account in determining stature: when the food supply is more or less the same, stature is more or less the same, whether it be of American Indian or Australian Bushman on the one hand, or African, Asiatic, or European on the other. The range of statures is precisely that which such considerations as those put forward in the previous section would lead one to expect.

AMERICA.

Fish + Flesh		*Flesh + Roots*	
Eskimo (Alaska)	5·4	Haidahs	5·6
Dogribs	5·5	Sahaptan	5·7
Chinooks	5·6	Utes	5·6
Kootenay	5·9	Apache	5·6
Comanches	5·6	Chippeways	5·7
Blackfeet	5·7	Patagonians	5·9
Crows	5·8	Abipones	5·5
Crees	5·6	Guasarope	5·5
Charruas	5·5	Mbayas	5·7
Macobys	5·5	Tobas	5·8
		Bororo	5·5
Average	5·6	Karakawas	5·9
		Onas	5·9
		Walapai	5·6
		Havasupai	5·7
		Average	5·7

Flesh + Maize		*Maize*	
Sioux	5·8	Navajos	5·7
Pawnees	5·7	Yumas	5·8
Ojibwas	5·8	Pimas	5·7
Lenguas	5·8	Papagos	5·7
Machicuys	5·8	Opatas	5·6
Iroquois	5·9	Mayas	5·6
Algonquin	5·8	Mexico	5·5
Muskohogian	5·7	Tepehuans	5·5
Concapah	5·9		
Yakui	5·7	Average	5·6
Mohaves	5·8		
Average	5·8		

Fish, etc. + Manioc	
Tribes at the source of the R. Xingu (Brazil)	5·4
Paresi	5·3
Caribs	5·2
Mundrueus	5·3
Guyanos	5·4
Jivaros	5·4
Arawaks	5·3
Average	5·3

MALAYSIA

Rice		*Rice + Game*	
Tenggerois	5·3	Jakun	5·3
Sundanese	5·3	Kayans	5·6
Sumatra	5·4	Bontoc	5·4
Nias	5·3		
Bugis	5·3	Average	5·4
Tangal	5·2		
Ilongates	5·0		
Tagbamas	5·3		
Dyaks	5·3		
Battaks	5·3		
Timor	5·3		
Hovas	5·4		
Average	5·3		

Sago, etc. + Fish		*Sago + Flesh + Cocoanut*	
New Guinea	5·4	Kiwai Island	5·5
Dutch N. Guinea	5·4	Motu Motu (S.E. New Guinea)	5·6
Solomon Islands	5·4	Admiralty Islands	5·5
Tasmania	5·5		
Average	5·4	Average	5·5

POLYNESIA

Yams, Taro, or Bread Fruit + Fish + Cocoanut		*Flesh + Roots*	
Carolines	5·8	Australians (mean of 10 averages from different parts of the continent)	5·6
Ellice	5·7	New Zealand	5·6
Tonga	5·8		
Marquesas	5·8		
Samoa	5·8		
Union Island	5·8		
Average	5·8		

AFRICA

Flesh + Corn or Milk		*Flesh + Corn + Veg. Butter*	
Latookas	5·9	Lobi	5·9
Dinkas	5·8	Pakhalla	5·8
Bongo	5·7	Ouolofs	5·9
Somali	5·8	Foulahs	5·9
Bambaras	5·7		
Amaxosa	5·8	Average	5·9
Bechuana	5·6		
Quissama	5·8		
Mossi	5·7		
Boulalas	5·9		
Abaddi	5·6		
Guanches	5·7		
For	5·9		
Average	5·8		

ASIA AND EUROPE

Wheat or Barley + Cattle	
Darwazis	5·6
Karateghinois	5·7
Galchas	5·6
Wakhan	5·7
Kashgar	5·7
Average	5·7

Wheat, Millet or Oats + Cattle or Fish	
Kabardians of the Plain	5·6
„ „ Mountains	5·7
Armenia	5·6
Albania	5·6
Tadjiks	5·7
Turcomans	5·6
Norway	5·8
Fins	5·7
Livs	5·8
Kirghiz	5·7
Scots	5·7
Average	5·7

Rice + Game	
Oraons	5·4
S. India	5·4
Chinese	5·4
Corea	5·4
Average	5·4

Rice	
Mundas	5·3
Japan	5·3
Looshais	5·3
N. Aracan	5·3
Punyas	5·3
Tongking	5·2
Laos	5·3
Siam	5·3
Average	5·3

DIET AND COLOUR

DIET AND COLOUR

I

The peoples of Europe are white, of China yellow, of Polynesia brown, of West Africa black; these statements are as true as most general statements concerning living creatures spread over large areas can be, and mark major differences in skin colouration. But within each of these groups there are minor differences equally certain and equally constant over particular areas. And it is as reasonable, or as unreasonable, to accept one cause, be it cross-breeding, climate, food, or these combined, for the major as for the minor modifications.

The diet of twelve peoples in groups of three, characterised respectively by white, yellow, red or brown, and black skin colour, will serve to show the manner in which the variable in food, correlative with the colour variable, was sought. The peoples chosen for comparison are: white, the middle-class English, the Russian peasantry, and the Georgians of the Caucasus; yellow, the Chinese, the Greenland Eskimo, and the Bushmen of Southern Africa; red or brown, the Sioux of North America, the Nyam Nyam of equatorial Africa, and the Maoris of New Zealand; black, the Mandigoes of West Africa, the Dinka of the Upper Nile, and the Mincopies of the Andaman Islands.

White.—It is unnecessary to give details of the customary fare of the middle-class English family; wheaten bread, oatmeal porridge, potatoes, and bacon or beef form the daily diet of most.

The staple food of the Russian peasant is black bread,

made from rye meal. They have a dish made from buckwheat, and also sour cabbage and cucumber. They seldom taste animal food : the weeks and days of fasting, together, make up half the year, and during these times the milk and eggs which perhaps they could afford are forbidden. The annual consumption of salt is 19 lb. per head.

The staple food of the Georgians consists of wheaten cakes, fresh cooked each day. They have rice too, and beans. At every meal they eat raw green vegetables—parsley, celery, etc. There is much cattle culture among them : though the poorer classes eat little flesh, they have plenty of cheese and milk.[1] During times of fasting, fish—salted, smoked or dried—plays an important part in their diet.

Yellow.—The Chinese are a nation of cultivators. But little meat of any kind is eaten, even among the wealthier classes ; and no Chinaman, rich or poor, makes use of milk, butter or cheese. Rice is the staple food, particularly in the middle and southern provinces. ' The chief thing they wish and work for is rice : their domestic accounts are entirely regulated by the quantity of rice consumed ; their meals according to the number of bowls of it boiled ; and their exertions according to the quantity of it wanted.' But in the north rice does not thrive, and wheat, mixed with rice or maize, and made into cakes or leavened bread, takes its place in the dietary of the comparatively well-to-do : the poorer eat a porridge of sorghum. In addition to cereal food, cabbages, fresh or pickled in brine, are consumed in large quantities ; also turnips, carrots, melons, beans, and peas. Salt fish is an almost universal dish. A bite of this, with two pounds of rice, some pickled cabbage, vegetables and fruit, forms the daily ration of the southern peasant. The Chinaman regards salt as a necessary condiment. Next to the land tax, the duty on salt is the

[1] Indeed, Spencer says that ' skhen,' a sort of sour milk with millet, forms a staple food of the Circassians, and that a quantity of this, preserved in tubs with salt, is kept for winter use. From time immemorial, the Caucasus and Armenia have been provided with salt brought on camel-back from the mines of Kulpi, and in considerable quantities too, for prior to the war with Russia the Circassians were accustomed to flavour the food of their cattle very plentifully with salt.

biggest item in the State revenue; the stocks near the shore at Tientsin contained, according to one authority, 600,000,000 lb., while the tax on the salt produced in the province of Szechwan alone amounts to £2,000,000 sterling annually, corresponding to an output of 237,946 tons. The Government are so jealous of the monopoly that the sale of brine in which fish or meat has been preserved is illegal.

The Greenlanders have little vegetable food: such as they have consists of angelica, dandelions, sorrel, and a few berries. Hunting and fishing find them sufficient. Seal, walrus, narwhal, halibut, and other fish abound, and it is only during a prolonged spell of bad weather that they begin to feel hunger; then they fall back on seaweed, shell fish, ptarmigan, and even the skins of their tents.

The Bushmen of the Kalahari Desert likewise are mainly dependent on flesh. They are intimately acquainted with the habits of game, which they prey upon even during migration. Their vegetable food consists of roots, leaves, and other fruits of the desert gathered by their women. After a successful hunt they will sleep till hunger drives them forth once more. When the locusts come they grow fat. There is no quarrelling with food; half cooked or half putrid, it is immediately devoured.

Red or Brown.—The Sioux Indians lived on the vast plains west of the Missouri river. Nowhere else was the buffalo so plentiful. The flesh of this animal, boiled, dried, or raw, formed the staple of their diet. But they ate, in addition, fish, deer, and even dogs. They made great use of roots and of maize; at times they feasted gluttonously on honey.

The Nyam Nyam, living between the Welle and Gazelle rivers in Equatorial Africa, are a tribe of hunters. Their word for *to eat* means meat, and meat is their first and last desire. At certain seasons and in certain places the supply of game is enormous, and their lust is satisfied. But sometimes they will return from the hunt with a supply of tubers, roots, and fungi. Their women, meantime, do all the agriculture necessary to procure a supply of eleusine—the ragi of

the East Indies—of yams, sweet potato, and cassava. Prisoners of war, or the bodies of the friendless, who have died, are consumed : human fat is sold universally.

The diet of the Maoris depended on the season, but there was plenty of food, both animal and vegetable. Shell fish was collected in great quantities in the summer and cooked ; often the dried flesh was carried away to the winter store. The flesh of birds and of a large frugivorous rat was greatly prized ; seals and sea-lions, sharks and whales, stranded on their shores, formed part of their food. The Maoris pursued agriculture with great industry. Their staple vegetable was the kumara root, but they grew much taro also—this root was always in season—and gourds. The fern root grew wild in many parts of the interior : this, after drying, kept good for years. Before eating, it was soaked in water, roasted a little, and beaten soft with a stone pestle. The Maoris thought much of it. The karaka tree grew only near the seashore ; the kernels of its fruit, after baking, steaming, and treatment with running water, were commonly eaten. Inland, other fruit, similarly prepared, took the place of the karaka.

Black.—According to Mungo Park, the Mandingoes of free condition breakfast before daybreak upon gruel of meal and water made acid with the fruit of the tamarind. In the afternoon they eat commonly a sort of hasty pudding, with a little butter obtained from the nuts of the shea tree. Their supper consists almost universally of kous-kous—small granules of maize or millet flour well cooked in steam—mixed with a small portion of animal food or shea butter. Field labour gives them ample employment during the rains ; but in the dry season those who live in the vicinity of large rivers employ themselves chiefly in fishing—others pursue guinea fowls, partridges, and pigeons.

Children suck pieces of rock salt as though these were sugar ; in the inland parts, the poorer classes are so very rarely indulged with this precious article that to them the statement *a man eats salt with his victuals* is synonymous with *he is a rich man.*

The ever-present idea of the Nilotic Dinka is how to acquire and maintain cattle. Schweinfurth estimated that they possessed three head of cattle for every human being. The death of an ox is to its owner as the death of a dear friend ; to his neighbours it is a call to carousal. Milk they consider the best of all foods—and this, with farina, forms the staple of their diet. The reaping, threshing, and sifting of sorghum is brought to perfection by their female slaves, who subsequently granulate the meal like sago. In times of scarcity they extract, with much soaking and washing, the farinaceous germs from the Borassus palm and from the tubers of Nymphaea. They have in addition yams, earth nuts, and earth peas. At the time of year when the corn supply begins to fail, fish is plentiful, and some of the catch they split and sun dry for the storehouse. They have no salt : to make up for this want they rinse out their drinking vessels with the urine of cattle.

The Andamanese are well provided. 'The jungles contain such an abundant supply of food, at all seasons of the year, that many times the present number of inhabitants could find ample provision for all their wants without resorting to the coast at all.' But there is difference of opinion as to the proportion the animal part bears to the vegetable part. Man says that about one-third consists of roots, honey, and other jungle produce, and the remaining two-thirds of pig, turtle, fish, iguana, and paradoxurus. Portman speaks of their food as largely carbonaceous, and mentions one tribe whose staple food is made from mangrove seed. All authorities are agreed as to the care taken in preparing their several viands : everything is cooked and eaten boiling hot. Indeed, there are demons who exact heavy penalties from those guilty of baking instead of boiling their pig. Their roots and many of their fruits are either roasted or baked, after much washing of the divided bits. The seeds of a kind of seaweed are carefully cooked and eaten as a relish ; but this is a luxury. The blood of the turtle only are they careful not to lose ; they have no salt. To preserve flesh it is boiled in a bamboo cane which

is then luted down. They drink very much water, never moving from home without a supply. All the boys and girls begin fasting periods between the eleventh and thirteenth year, which last from one to five years. During this time they abstain from eating turtle, honey, pork, fish, iguana, paradoxurus, and larvæ.

The peoples referred to above, with the exception of the Greenlanders, have all of them a mixed diet of animal and vegetable food ; but with the black Mandingo the vegetable part is predominant, with the yellow Bushman the animal. It is not the vegetable or animal diet as such that constitutes the variable we seek, yet it is apparent that, other things being equal, people are the fairer the more animal their diet.

Is there anything that is present in flesh, particularly raw flesh, but not in the Dinka's milk nor the Mincopie's boiled meat, that is markedly wanting in farinaceous food, but yet is present in the food of Western Europeans in even greater measure than in such pronounced carnivores as the Greenlander or Bushman ? There is salt.

The mineral contents of 100 parts of sundry articles of food are set forth on the opposite page.

It is to be noticed : First, that there is no great difference in the amounts of mineral matter present in raw vegetable and animal foods ; secondly, that while the percentage quantities of chlorine and sodium in vegetable substance is relatively small, in animal it is relatively large, and in blood very large ; thirdly, that there is a great preponderance of potash over soda in vegetable but not in animal tissue ; fourthly, that the preparation of tapioca and sago entails great loss of mineral matter ; and lastly, that the fresh water pike is much behind the salt water cod, both in its chlorine and sodium content.

At first sight it does not appear that the flesh diet of the Bushman yields him salt in such excess of that supplied by the farinaceous diet of Mandingo or Dinka as would suggest that this substance is the variable sought for.

Bunge, looking at common salt from the physiological point of view, observed that the desire for this condiment was present in herbivores but never in carnivores. He could see no reason for this, since, as seen above, vegetable

	Min. matter in 100 parts	Chlorine	Potash	Soda
Wheat flour	0·48	0·32	31·36	3·07
Rye meal	1·44	0·48	32·1	1·47
Maize meal	1·33	0·91	29·78	1·10
Rice	0·82	0·86	17·51	5·53
Sorghum vulgare	1·95	0·00	20·34	3·25
Oat meal	2·12	0·94	17·9	1·66
Pea meal	2·89	1·54	41·79	0·96
Bean meal	3·35	0·86	44·01	1·49
Potato	1·09	3·26	60·06	2·96
Cucumber	0·44	9·16	51·71	4·19
Pumpkin	0·73	0·43	19·48	21·13
Tapioca	0·12	..	..	..
Sago	0·19	..	..	..
Cow's milk	0·71	20·28	21·16	13·30
Half-fat ox	0·82	6·4	38·7	7·46
Eggs	1·12	8·98	17·37	22·87
Blood	1·01	32·92	10·64	41·28
Dry Cod	11·26	38·11	13·84	36·51
Dry Pike	6·13	4·74	23·92	20·45

and animal food alike contain chlorine and sodium. He bethought himself of some chemical truths: if sodium chloride be in solution, and carbonate of potash be added, double decomposition will occur,—potassium yielding some of the carbonate radical to the sodium and taking, in its place, chlorine hitherto combined with the sodium. Such a chemical change having occurred in the blood, the kidneys cause expulsion of the sodium carbonate formed. In this manner common salt, as such, is withdrawn from an organism by ingestion of potassium salts.

'I have proved,' says Bunge, 'the correctness of this deduction by experiment. To a diet of a uniform character salts of potassium were one day added, the consequence being a striking increase in the excretion of chlorine and sodium. I have tried the experiment on myself, with all the salts of potassium which are concerned in human nutrition. Eighteen grammes of potash, as phosphate or citrate, divided into three doses during the day, took up six grammes of common salt from the body, besides two grammes of sodium; for the potassium salts effect an exchange, not only with the chloride, but also with other compounds of sodium as albuminate, carbonate and phosphate.'

'The amount of potassium taken in these experiments was not large—in fact, much less than that introduced with the most important vegetable articles of diet; and yet six grammes of salt were withdrawn from the organism by it. This is about one half of the common salt which is contained in the five litres of a man's blood. That other tissues likewise suffer by the loss is undoubted. But in the first instance the blood is chiefly affected, and I think that if this loss in the blood was covered by a comparatively small loss in the other tissues, a fresh addition of potassium must have the effect of producing a fresh loss of sodium.' Bunge concludes that carnivorous man requires no salt, and he shows in how many cases investigation proves this conclusion correct.

The following figures give the price of salt per ton in the United Kingdom during the first half of the nineteenth century, and the number of pounds per annum consumed by each head of population:

1800–1806	£32 per ton	16 lb.
1807–1815	£32 „	16 „
1816–1823	£32 „	16 „
1824–1840	£1 „	19 „

Since with a great reduction in price there was so small an increase in consumption, it would appear that 16 lb. or thereabouts is the amount of salt required to satisfy the needs of the body. This 16 lb. or 7·143 kilos, corresponds

to a daily consumption of 19 grams. König gives 17 grams as the average requirement to-day of the grown man. Vierordt, quoting from four observers, gives 15 grams as the amount expelled in the urine. Kaupp found that intake and outgoings balanced at 11·7 grams.

In 1884 the consumption per head of population in different countries was as follows :

United Kingdom	80 lb.[1]
France	50 „
Germany	25 „
Russia	19 „
Austria	14 „
Italy	18 „
Spain and Portugal	17 „
United States	39 „
India	9 „

If an individual ate of one foodstuff only, he would require the following quantities (in grams) to make good the loss of energy due to the body's metabolism during twenty-four hours, containing the amounts of potash, of soda, and of chlorine stated :

		Potash	Soda	Chlorine
Wheat	774	4·33	0·4	0·41
Rye	830	5·31	0·24	0·08
Maize	873	3·36	0·12	0·1
Rice	750	1·07	0·31	0·05
Potato	2,900	19·22	1·0	1·1
Pulse	970	12·51	0·34	0·34
Half-fat ox	2,450	7·74	1·56	1·27

We are informed that there is not only a parallelism between the amounts of salt and urea excreted in the urine, pointing to the close association of the former with vital processes, but also that the absolute amount of salt excreted is greater the greater the quantity of liquid imbibed. Experiment shows that the volume of urine depends directly

[1] Much salt is used for chemicals, manures, etc.

on the amount of water taken in, and that, if the chlorine intake is constant, the chlorine elimination varies with the volume of the urine. With a moderate consumption of liquid the normal volume of urine in 24 hours is 1,500–1,700 c.cm., containing 16–17 grams of salt. One observer, during six hours, found that without drink he eliminated 337 c.cm. of urine, containing 2·93 grams of salt, but that with an intake of 1,800 c.cm. he eliminated 1,433 c.cm., containing 5 grams. Again, a man loses 700–900 grams as sweat each day, containing 3·2 to 4·1 grams of sodium chloride.

The bearing of a hot climate on the amount of salt in the system is obvious.

The Dinka are herdsmen, and milk forms an essential part of their diet : a glance at the composition of the mineral matter of milk suggests that in this milk they would find sufficient salt to differentiate them from the more farinivorous Mandingo. But the milk analysed was the milk of European cattle, to whose food salt is invariably added. The cattle of the Dinka are not provided with salt in any form whatever ; ' its admixture with their food would infuse new life and vigour into them ; nothing but this, I feel convinced,' says Schweinfurth, ' kept up my own supply of milk and prevented my cow from becoming emaciated ; at first the dose had to be administered by force, but the creature not only soon became accustomed to it, but would run after me for a handful of salt, like a lap dog for its sugar.' With its considerable rainfall Dinka land must, in some respects, be comparable with the district about Lake Chad, where, according to Barth, ' there is no salt at all, and in which the herbage is so destitute of this element, that the milk of the cow and sheep fed on it is rather insipid and somewhat unwholesome.'

And it is probable that in the Andaman islands also, where there is an annual rainfall of 100 inches, the vegetation is less rich in salt than it is in other places, and that the pigs and other animals living on it are correspondingly poor in this substance. Much of the salt that is present is removed by the boiling of flesh and by maceration and washing of vegetable foods. Moreover, during some four

or five years of their growth the Andamanese abstain from flesh food altogether. They are continually drinking water. Although, therefore, the Andamanese are among the blackest of men, they offer no decisive case against the suggestion made, that salt is the variable sought for.

The Greenlanders obtain their food almost entirely from the sea, and little salt can be removed from the body of fish or animal before it is consumed half raw; moreover, they are very careful to avoid loss of blood from the animals they slaughter, whose wounds they are said to plug. Nor are the Bushmen of South Africa less precipitate in consuming their game half putrid or half raw.

The following table recapitulates and co-ordinates some of the facts presented in the preceding pages:

		Colour	Food	Salt
I.	English, Russian, Georgian	White	Farinaceous, with some flesh	Much
II.	Chinese	Yellow	Farinaceous, with salt fish	Some: but salt is highly taxed, indeed in some inland places it represents money.
	Greenlander	Yellow	Sea fish and flesh (half raw)	Less than Class I.
	Bushman	Yellow	Flesh (half raw), some roots (salines frequent)	Less than Class I.
III.	Sioux	Reddish brown	Much flesh, maize and roots	Certainly less than in the Bushman's diet.
	Nyam Nyam	Reddish brown	Much flesh, corn and roots	Do.
	Maori	Reddish brown	Roots, much fish and shell-fish	Certainly less than Greenlander.
IV.	Mandingo	Black	Farinaceous	Very little, from expellent action of potash.
	Dinka	Black	Farinaceous, with milk	Very little, from expellent action of potash; very little too in milk.
	Andamanese	Black	Flesh and roots	Very little, as flesh is mostly boiled and roots are macerated and washed.

If the quantity of salt consumed, directly or indirectly, is a variable associated with colour regarded as a variable, the following propositions will be found true :

1. Of all men those will be the fairest who, desiring salt, have at command as much as they desire ;
2. Those will be less fair who, otherwise similarly circumstanced, can procure but little salt ;
3. Among those who have, as their staples, farinaceous or vegetable food, who, moreover, possess little or no salt, the following will be the order of pigmentation :

   Fairest, those whose staple is rice. For, as Bunge has shown,[1] the absolute amount of potash is less in a given weight of dehydrated rice than in an equal quantity of any other food ; and it is on the absolute, not relative, quantity of potash present that its power of expelling soda depends.

   Less fair, those whose staple is some cereal other than rice.

   Still less fair, those whose staple consists of roots.

   Darkest, those whose staple is ' farine ' prepared by the maceration and washing of roots, pith, or fruit. For in this case removal of all soluble salts, whether of potassium or sodium, will necessarily follow from the mode of preparation.

[1] In 1000 parts of dehydrated material the proportions are :

	Potash	Soda
Rice . .	1	0·03
Bullock's blood	2	19·00
Oats, Wheat, Rye, Barley . .	5–6	0·1–0·4
Apples . .	11	0·1
Peas . .	12	0·2
Milk of herbivora	9–17	1–10
Hay . .	6–18	0·3–1·5
Beef . .	19	3
Beans . .	21	0·1
Strawberries .	22	0·2
Clover . .	23	0·1
Potatoes .	20–28	0·3–0·6

4. Of those whose staple is fish or flesh, those will be the fairest who live on the produce of the sea ; and the consumption of root food will cause darkening of the skin.
5. Where salt or salt-containing foods are luxuries, the upper or wealthier classes will be fairer than the lower or poorer classes.
6. Other conditions being similar—
   (*a*) Those who live on small [1] or narrow islands will be fairer than those who live on large islands ;
   (*b*) Those will be darker who live in the more rainy districts ;
   (*c*) Those will be darkest who drink the most liquid.

II

Colour of Animals

When speaking of degrees of pigmentation among 'white' peoples it is usual to refer to the colour of hair and eyes rather than to skin colour ; and this custom will be followed below. It is probable that the greater or less pigmentation of hair and eyes is due to the same cause as the greater or less pigmentation of skin. To find hair other than black and eyes other than brown or black outside the European area is very exceptional, and within this area it is unusual to find a blonde with other than a very fair skin. Are the major differences in pigmentation of hair and eyes, equally

[1] The effect of 'sea air' may be judged from the following :
Angus Smith found 85·5 grams of hydrochloric acid in 1 million cubic metres of air on the cliffs north of Blackpool 30 yards from the sea ; this was between 11 and 1 p.m., with a south wind blowing, but not direct from the sea ; it had been raining till 11 a.m. 85·5 grams of hydrochloric acid correspond to 137 grams of sodium chloride. Michael Foster gives 17 inspirations a minute as the normal rate of breathing and 500 c.c. as the average volume of tidal air. It follows, then, that in the 24 hours 1·7 mgram. of salt passes through the mouth by the process of breathing alone. If we allow for that caught up by the food, by the mouth, lips, and hands, it will appear that much more than this is in reality ingested from the air.

with the minor differences in pigmentation of skin, associable with differences in the amount of salt present in the system ?

The next few pages summarise information derived, in great measure, from the 'Royal Natural History' published in 1893–94. This work gives full details as to the colouration and, in many cases, as to the food supply of the many animals described. Qualitatively the colouration of animals is identical with that of humans ; there are the same shades of yellow and red, chestnut and brown ; there is white hair and black hair. With white hair for the moment I have nothing to do, with grey hair I am concerned only in so far as there is colour still present : both modifications are characteristic of the aged or, it may be, diseased of all species, human and animal ; here is complete or partial absence of pigmentation.

In view of the enormous preponderance of black hair among humans, it is on first thoughts surprising that there are so few of the lower order of beasts with all black or even all blackish hair. But the pigment of hair and skin are probably one and the same : spread, in the case of furred animals, over much larger areas than in the case of the partially naked. Generally, skin under fur is light coloured, not, as with most humans having black hair, tawny, copper coloured, brown, or black. Some animals indeed have black skins, and just those without much covering of hair, as the elephant, rhinoceros, hippopotamus, certain of the anthropoid apes, and other quadrumana. But the bulk have parti-coloured coats, with spots, stripes, bars or patches of darker or lighter colour on a uniform ground. In the case of Man also, anthropologists who have the opportunity of observing the all-naked subject discriminate between the colours of cheek, back, chest, belly, limbs and so on. As, however, in speaking of numbers they find one tint which renders the total effect, so in respect of animals I have endeavoured to give the mean of those shades which are displayed by the coat as a whole. Thus I speak of the lion and tiger, the Arabian camel, the mouflon and dor-

mouse as reddish yellow or yellow; the weasel, the striped hyæna, the ibex and hartbeest as reddish brown or brown; the racoon, stoat, wapiti and tapir as dark brown; the Tasmanian devil and the gorilla as black.

The food of the beast differs from that of man, first, in that it is eaten unprepared; secondly, in its greater specialisation: nothing is lost by the solvent action of water through maceration or boiling, and any pigmentation associated with a particular type of food will be found accentuated. With few exceptions the carnivore is a carnivore always, the beast that eats 'grass' eats nothing but 'grass.' If the contention is right that the hair of an animal as of man will be lighter or darker according as more or less salt is present in the system, then by virtue of the quantities of this substance present in unbled flesh, in grasses, in fruits and roots, we shall expect to find carnivores the fairest, gramivores less fair, and those living on roots and fruits the darkest. And in all of the three classes we shall expect those to be less fair which by their fondness for water, or by greater weight of rains, are deprived of some of the salt that would normally come to them in their food.

I have classified, according to pigmentation, 122 beasts, which with few exceptions, under ordinary conditions, are purely carnivorous, and 403 that live on grasses, leaves, roots, or fruits, with the following results, in percentages:

	Carnivores	Eaters of Grass, Roots, or Fruits
Black	3	12
Blackish	1	8
Dark brown	22	13
Brown or reddish brown	16	35
Yellow or reddish yellow	39	21
Yellowish brown	18	11

Thus in the two fairest classes there are 57 per cent. of the

carnivores and 32 per cent. of the vegetable feeders, in the two darkest 4 per cent. of the carnivores, 20 per cent. of the vegetable feeders ; on the other hand, there are 22 per cent. of the carnivores among the dark browns as against 13 per cent. of the vegetable feeders.

Of these twenty-two dark brown carnivores, ten live in or take much of their food from the water, while, of the remaining twelve, six are among those which consume fruit in addition to flesh ; of the thirty-nine in the fairest class, two only frequent the water and six consume fruit.

The following table gives, in percentages of those classified under each colour heading, the beasts that live on fruit, on grass, on mixed diet, and under such conditions that soluble salts are likely to be dissolved from their food. The food of some is not known at all or is matter of doubt, and these I have entered as ' unclassified.'

Food	Black or Blackish	Dark Brown	Brown or Reddish Brown	Yellow Brown	Yellow or Reddish Yellow
Fruit or roots .	76	23	2	..	..
Fruit or roots with flesh	..	..	9	4	12
Grass . .	..	18	34	56	42
Grass with roots or fruit and in some cases insects	..	6 } 24	30 } 64	21 } 77	37 } 79
Food subject to action of water or snow	14	33	9	4	2
Unclassified .	10	19	16 (12 monkeys)	14 (monkeys)	7 (monkeys)

It is not possible to differentiate with certainty those that live only on grass from those that add to their grass diet roots, fruit, and possibly insects in different measures at different seasons ; and the added numbers for these two classes will guide opinion more surely than the numbers for each class taken separately.

I have endeavoured to determine how far animal colouration is co-ordinate with average rainfall; if salt is causally associated with pigmentation we shall expect to find, whether the animal subsists on fruit and roots, on grass, on mixed diet, or on flesh alone, a tendency to deeper colouring in wetter districts. In the following tables the numbers are again percentages of the number of animals considered under each colour heading: those for the carnivores are based on too small an induction to be conclusive one way or the other. Beasts that live in marshy places or are habitually found in marshy places are excluded from the calculations.

Annual Rainfall		Black or Blackish	Dark Brown	Brown or Reddish Brown	Yellow Brown	Yellow or Reddish Yellow
		(57)	(38)	(110)	(35)	(61)
Vegetable feeders	50 ins. and upwards	77	74	45	23	16
	25–50 ins. .	21	26	48	69	31
	below 25 ins.	2	..	8	9	53
			(15)	(11)	(16)	(26)
Carnivores	50 ins. and upwards.	..	47	18	25	31
	25–50 ins. .	..	47	73	42	50
	below 25 ins.	..	6	9	31	19

Numbers from which the percentages are calculated, in brackets.

Carnivores, then, tend to be coloured reddish or brownish yellow; herbivores and those living on a mixed diet of grass, roots and fruits, reddish brown to yellow; frugivores, blackish or dark brown. Moreover, whatever the food, there is a tendency to dark colouration among those beasts which live in the water, frequent marshy places, or live in an area of heavy rainfall.

III

Europe and the Near East

Salt had an important place in early religious ceremonial and in the domestic economy of civilised peoples: to eat no salt was to confess barbarism. Many of the great commercial routes owe their origin to its transport.

Salt is found in the earth as 'rock salt,' or is prepared by evaporating sea water or the brine from salt lakes or springs. To the great bulk of mankind it is a luxury, to many it is almost or entirely unknown. There can never have been superfluity for those who lived at great distances from mine or centre of brine culture. It is only in Europe that nature has been prodigal of her gift over widespread areas. The most extensive deposit perhaps in the world is that which stretches for 500 miles along the Carpathian mountains, striking out laterally for a hundred miles, with a thickness in some places of 1,200 feet. Further west there are considerable deposits in the Bavarian and Austrian Alps, in the Jura, the Vosges, the Pyrenees and Celtiberian mountains, in Britain, and at Carrickfergus in Ireland. To the East, Lake Inder in the Urals, Lake Elton in the Kirghiz steppes, and numerous salt lakes on the right bank of the Irtysh precipitate great masses of salt during the heat of every summer. To the South there is the Sambhar Lake in the Rajput District of Hindustan, where each April a wide expanse of crystallised salt lies exposed; and westward there are the salt lakes of Southern Persia and Judea, the deposits in the coastal range of Arabia, the saline marshes through which the Suez Canal now passes, and, along the north coast of Africa, 'pieces of salt in large lumps or hills,' stretching, according to Herodotus, at intervals of a ten days' journey from Egyptian Thebes to the columns of Hercules. In China there are inexhaustible brine springs in the province of Szechwan and elsewhere. The eastern plains of Siam, during the drought of summer, are covered with a saline efflorescence.

To localise the great wealth in salt of North and South

America would be to lose sense of proportion: there distances are vast, and to many of the native tribes the use of salt as such was unknown.

About half the world's salt comes from the sea; but it was only in countries whose area is small compared with their coast line, where the sun too is powerful to aid evaporation, that the exploiting of this source could be stimulated. And in these respects, as in her wealth of rock salt, Europe stands almost alone.

The peoples of the world, therefore, in respect of their salt supply, are separable into two groups: those inhabiting Europe, the west of Siberia, Afghanistan, Persia, Syria, and the north of Africa, and the rest; a separation which is almost identical geographically with that suggested by light and dark skin colour.

The blondest[1] people in Europe, according to Ripley, are the Norwegians; next in order of blondness come the Swedes.

Little is known of the manner of life of the Scandinavian peoples before the eleventh century. They were bold sailors, crossing hundreds of miles of sea to ravage and colonise. They breathed constantly salt sea air. Though there is no evidence of an indigenous industry in salt, it is reasonable to suppose that they were not unprovided with what outside their country was deemed a necessary of life. The Sound was a highway of maritime commerce: tolls were exacted of all foreign merchandise that passed through, and the earliest tariff of which there is record makes reference to cargoes of salt.

Samuel Laing, writing in the thirties of last century, says that fish appears to be the basis of a Norwegian repast everywhere; these may be fresh from the river or salted from the sea. Other foods are oatmeal, barley meal, and

[1] In estimating pigmentation some European countries count the numbers following a pure type, brunette or blonde, with dark hair and eyes or blonde hair and eyes respectively; others take the number having dark hair together with those having dark eyes, whether these traits occur together or not, as the measure of brunetteness. Ripley finds that the results are the same whichever method is adopted.

potatoes, with milk, butter, and cheese. Animal food—salted beef or black puddings—is customarily taken twice a week. The diet of all classes is more nearly the same both in quantity and quality than among us.

It is important to notice that cattle in Norway are fed in great part on boiled seaweed, on the heads and bones of fish, or on the superabundance of herrings. From statistics it is calculated that in 1835 there was imported into Norway 25 lb. of salt per head: some of this, however, was used in salting fish for exportation: 20 lb. per annum is equivalent to 25 grams per diem.

In 1845 seven-eighths of the population of Sweden followed agriculture among other occupations. There were 15,000 employed in factories. This is how the latter were fed. Breakfast: rye bread with coffee, milk and sugar; dinner: during nine days, twice, 6 oz. of bacon with three pints of pea soup, salt and pepper; twice, 8 oz. of fresh meat, salt and potatoes, with 1 pint of soup, 1 pint of porridge and a little milk; twice, ½ lb. salt herring, 8 oz. potatoes and 1½ pints of pea soup; and three times, fresh meat and bacon. Every day at dinner they were provided with a cake of rye. They found themselves supper. According to statistics there was an importation of 7–8 lb. of salt and of 2 lb. or thereabouts of salt fish per head in 1830.

These peoples, the blondest in the world, are remarkable for their dependence on salted provisions. In view of the greater blondness of the Norwegians it is to be noted that while the Atlantic Ocean contains 81 lb. of salt per ton, the Baltic Sea contains only 28 lb.

After Norway and Sweden, in order of blondness, come Denmark, perhaps Holland—but here the data are insufficient—and the northern parts of the German Empire. If we include the north and east of Scotland and the east of England, and mid-Germany, to the northern boundaries of Hesse, Bavaria and Bohemia, we have an area where blondness is exhibited by 95–85 per cent. of the population. The crops commonly grown for home consumption are: in Denmark rye and barley, in Germany rye and potatoes, in Scotland oats, which with milk forms the staple diet of

the population. All these countries have great length of coast, and fishing industries are actively followed. The agricultural labourer of England and Scotland eats little meat ; in Prussia the average annual consumption is 69⅔ lb., with which may be compared the 211 lb. consumed by the average Londoner.

There are important salt works in Saxony and in the western provinces between the Lippe and the Ruhr. Between the years 1827 and 1836 there was a yearly average consumption of salt over the whole of Prussia of 16·7 lb. Countess von Bothmer, in her ' German Home Life,' speaks of ' three great characteristic divisions of German food—the salt, the sour, and the greasy '—' the love of Germans,' she says, ' for every kind of salt and dried fish is apparently an appetite that grows by what it feeds upon.' She speaks, too, of stores of vegetables sealed down with salt and water, and preserved by every housewife against the coming winter. Figures given for the annual consumption of salt per head are : for Denmark 22 lb., for England 20 lb.

The peoples living on the Russian Baltic coast are very fair : Ripley finds 67 per cent. of pure blondes (a number based on the colour of skin, eyes, and hair combined) among the Letto-Lithuanians, and only 5 per cent. of pure brunettes ; the Livs and Ests living to the north of them and the Poles to the south are scarcely darker. All alike live by agriculture : rye is the staple, but oats and barley also are grown—indeed, the poorer folk among the Ests at certain seasons of the year subsist almost entirely on the latter grain. They have no vegetable but cabbage,[1] and of this they eat largely ; the Poles have peas and some few potatoes. Flesh they taste seldom, but the coast peoples, particularly the Ests, are bold and successful fishermen.

Russia and Siberia are very rich in rock salt and in saline springs and lakes : Mulhall gives 19 lb. as the average consumption of salt per head in 1884. Of the Poles [2] it is

[1] Composition : Potash, 17·53; soda, 11·57; chlorine, 5·83, in 100 parts of ash.

[2] Tegaborski quotes 2,369,856 poods imported from Austria. This, with a population of 7,083,475, gives 12·2 lb. per head.

said ' they use much salt with their vegetable food, and in spite of the heavy tax on that commodity can never dispense with it at their meals. When the peasants bring their trifling quantities of produce to the market towns, part of the money received is first used to purchase salt.' It is important to notice how relatively large are the proportions of soda and chlorine in the ash of cabbage.

There are some 57 per cent. blondes among the White Russians and Podolians. With them we may class the Austrians, Swiss, Belgians, French (in the north-eastern half of the country), Irish, and Western British.

The staples of the White Russians and Podolians are rye and potatoes. Instead of rye, the Southern Austrians use millet. The Swiss and Irish subsist on potatoes and milk, seldom eating flesh ; in France, Belgium, and Western Britain wheat is the common grain food. The quantities of flesh food consumed in the year are 20½ lb. by the Russians, 45 lb. by the French, 45 lb. by the Belgians. In 1844 the consumption of salt per head was 21 lb. in Russia and Siberia, 18 lb. in Austria, 14½ lb. in Belgium and France,[1] 20 lb. in England. Salt was imported into Switzerland from Austria free of duty and was not dearer there than in Austria.

South and east of the Baltic and western provinces, among the Little and Great Russians the blondes number 33–40 per cent. Means of transit are limited, and the distances to the salt mines and lakes of Orenburg and Saratov are great ; the produce of the salt marshes in Bessarabia and Crimea are farmed [2] out to individuals, and prices are high.

The blondest people of Italy are found in the provinces of Lombardy and Venetia, open to the highways over the Alps, and separated from the rest of Italy by the barrier of the Apennines. They, with the peoples of central and south-west France, are 38–42 per cent. of them brunette. The Magyars are darker.

[1] *Patria. La France Ancienne et Moderne.* Paris, 1847.

[2] *Cf.* Macgregor, *Commercial Statistics*, ii. 803. Tegaborski, writing in 1855, says that only the Crimean lakes and the salt springs in the government of Perm were farmed out to individuals.

Lombardy and Venetia are perhaps the most thriving provinces of Italy and their people the best provided: Indian corn, potatoes, rye, and buck wheat, with milk, cheese, and a fair supply of pork and lard, are the food of the majority. In Central France, in the Morvan for example, the food is almost entirely vegetable—soup with addition of lard, haricot beans, green stuff, and sometimes rice and macaroni. In Hungary the staples are rye bread and cheese. One thing common to these last-mentioned peoples is an increasing difficulty in the procuring of salt: in Lombardy and Venetia salt is taken as part payment for services rendered; in the Morvan, till quite late times, there was forced abstention from it for the greater part of the year; in Hungary, in 1839, a hill of pure rock salt, though unworked, was surrounded by soldiery to prevent petty thefts by the peasants, and smuggling was so rife that even great proprietors only took so much from the Government supply as would deceive those who did not wish to see.

In the South of Spain and in the islands of Sicily and Sardinia more than 66 per cent. are pure brunettes, in Greece 96 per cent. The skin too in these countries is markedly pigmented. Spaniards and Italians have an olive complexion, and Roumanians are scarcely to be distinguished from them. The Bosnians are only 20·5 per cent. of them white; the Osmanli are tawny or white.

The great majority of Spaniards are engaged in agriculture. Wheat is the cereal chiefly cultivated, but rye is grown in the higher parts of the mountains, and everywhere some ground is given to the cultivation of maize. In the production of pod-fruits and kitchen vegetables Spain has no equal in Europe: the chick pea forms part of the daily food of all classes of inhabitants.[1] Much dried cod is eaten

[1] 'In no part of Spain,' writes Inglis, 'least of all in Biscay, is it the custom to live extravagantly and luxuriously: of whatever rank a Biscayan may be, he takes his cup of chocolate and bread, followed by a glass of sugar and water, about 8 o'clock; he dines about one, and, six days out of seven, his dinner consists of broth and a "puchero," which is boiled beef, with a small piece of pork, surrounded either by cabbage or Spanish peas, and varied occasionally with a sausage; a cup of coffee again in the afternoon; and for supper boiled lettuce, prepared with vinegar, oil, and pepper.'

throughout the greater part of Spain ; milk is everywhere scarce.

Where fruit and olives are abundant there is poverty, as we understand it : it is not worth while to work. The ordinary breakfast of the lower classes in Madrid consists of fruit and bread, made without leaven and without salt ; hundreds, too, who by their dress might pass for courtiers, dine upon bread and a bunch of grapes, and go from the Pasco to hide themselves in a garret.

Enormous quantities of salt are prepared from sea water in the Bay of Cadiz and at Torrevieja in Alicante, and mines of rock salt are found scattered over the country ; but the price is high. In 1884 the consumption per head was 17 lb. Figures obtained at an earlier date show that all the salt produced, whether from the mines or from sea water, would only have given 16 lb. per year to each head of population, and very much was exported.

In Italy the conditions of living are much the same as in Spain ; oil and fruits in plenty, little flesh food of any kind for the peasantry, and very little milk. Wheat and maize, the staples of the north, give place in the south to barley, in Sicily to rye, in the hill country to chestnuts. In Sardinia there is much raising of cattle, and here more flesh food is taken than in any other part of Italy ; beans are largely grown and much fish and shell-fish is taken from the lagoons. The agricultural labourers of Sicily receive their daily portion of coarse bread with pulse or cheese or perhaps half a pint of olive oil ; they scarcely know the taste of butcher's meat. The salt monopoly yields something like £3,136,000 annually to the Italian exchequer ; it is illegal to draw a bucketful of water from the sea for domestic purposes.

Bay salt is manufactured in Tuscany, Rome, Naples and Emilia, on the east and west coasts of Sicily, and at Cagliani in Sardinia ; the rich deposits of rock salt in Sicily are scarcely worked at all. In 1884 the consumption per head in Italy was 19 lb., but Macgregor, writing in 1844, gives the consumption of salt per head in the Roman states as 13 lb. per annum ; and these states were exceptional in possessing four salt works, two on either coast. Com-

putation from figures of sale of the same date gives 4½ lb. as the consumption per head in Sardinia, where prior to 1828 there were no roads at all.

The staple food in Roumania is a dough of maize flour to which sometimes milk is added ; in Macedonia the bread is composed of coarsely ground wheat mixed with rye or maize, in Albania of wheat, barley, or maize ; it is only on the greater feast days that the peasantry of Roumania or Macedonia can afford a little meat, and very little milk is obtainable. The Albanians are better off : cheese of goats' milk, eggs, and fish form a regular part of their diet, to which on holidays they add kids and sheep from their herds.

The salt mines of Roumania brought 5,415,324 piasters annually to the Government : the tax was paid by those to whom the mines were farmed, who imposed their own charges. Between 17 and 18 lb. were produced for each of the then (1844) 3,500,000 inhabitants : if allowance were made, however, for the quantity which travelled beyond the frontier, this figure would probably be found to represent twice the home consumption. An estimate of the consumption of salt in Albania gives the inhabitants 4½ lb. per head.

The peoples of the Caucasus eat bread as their staple food, made from barley among the Ossetes, from wheat, maize or millet among the others. Much of their energy is devoted to the tending of cattle, and, though they do not consume much flesh, cheese and fermented milk form part of their regular diet. Moreover, they consume great quantities of green food. Much of the flesh they do eat is salted and, during times of fasting, fish—salted, smoked, or dried—is an important dish. The amount of salt consumed must be considerable : the Caucasus lies adjacent to the salt-bearing steppes between the Volga and the Don and is traversed by a great high road passing through the country of the Ossetes. Edmund Spencer, writing in 1839, tells us that 'previously to the war with Russia the Circassians—Kabardiens—were accustomed to flavour the food of their cattle very plentifully with salt ; but now, in consequence of the strict blockade maintained

on their coasts, they are prevented from receiving the necessary supply of this invaluable article, which they were in the habit of procuring from the Turks.' In the south, at Kulpi, Kagysman, and Nakhitchevan on the river Aras, there are mines of rock salt, said to be inexhaustible, which from time immemorial have supplied the Caucasus and Armenia. It is carried on camel-back, and everywhere in Transcaucasia such caravans are to be met.

The sedentary populations of Asia Minor are chiefly Osmanli and Armenian : of the former some 12 per cent. are blondes, of the latter the great majority are pure brunettes. Eastward of these are the peoples of Azerbijan, with brown eyes and deep chestnut or black hair, and still further eastward the Tajiks of Khorasan, of Balkh and Badakshan, the Turkomans, the Sartes of Western Turkestan, the Afghans, the Darwazis—these with skins fair or slightly tawny and with hair and eyes frequently fair.

Among all these peoples wheat or barley, in the form of bread or paste, constitutes the staple food : they make great use of milk and its products, but are mostly too poor to sacrifice their flocks. On the high lands, in Afghanistan, Badakshan and Darwaz, mulberries are dried, ground to a paste, and eaten for bread.

A common feature of both Asia Minor and Persia are the saline lakes, which in the heat of each summer are converted into broad expanses of salt. The earth of Khiva and Bokhara is strongly impregnated with salt, and near Karshi there are mines, the rock salt from which is largely sold throughout Asia. Ferghana exports salt ; the mineral is worked at Chal, near the frontier of Badakshan, and within that frontier ; there is a salt lake on the Ghilzai plateau of Afghanistan, and the inexhaustible supplies of the salt range in the North-West Punjab have been worked for centuries. West of the Indus salt is quarried in the open.

The Greeks are, according to Weisbach, 96 per cent. of them pure brunette—Ornstein finds that 25 per cent. have blue or grey eyes : their skins have an olive tinge. They live

now much as they did in classical times: bread or gruel of wheat or barley meal is their staple. Greece is a land of fruit and olives, a land where there is much poverty but no starvation. At all times fish has been a common and much appreciated food. In ancient Greece, poor men, who probably had no other seasoning for their food, were spoken of contemptuously as salt lickers. Clarke describes a meal given to him and others at Platano in Thessaly, at which the sole fare consisted of cakes cooked on the embers, raw onions and salt. Cakes strewed with salt and eaten with wine had a place in the menu of the classical feasts, and olives, figs and nuts seasoned with salt were eaten at dessert, partly, doubtless, to induce thirst. Almost sufficient salt for home consumption is made in modern Greece at Missolonghi, where, in 1843, some 12·2 lb. per head per annum was produced.

The Finns proper are divided into Karelians, occupying Eastern Finland to the coasts of the White Sea, with a brownish complexion, grey-blue eyes, and chestnut hair, and the Tavasters in the west, on the Gulf of Finland; these have a white skin, blue eyes, and light flaxen or towy hair. Karelians and Tavasters alike live largely on rye or barley bread, with which in times of scarcity finely powdered straw, Iceland moss, fir or birch bark is mixed before baking. Potatoes and oatmeal form part of their daily fare, and, though they seldom eat flesh, fish and the curds of milk make part of most of their meals. There is no word for salt in the Finnic tongue, and even now the nomad families, living near the White Sea on the produce of the chase and fishing, have none of this substance. But the sedentary people do eat salt, and the supply is considerable, open as their country is to the trade of the Baltic and the White Sea.

The Tcheremiss and Mordvins—Volga Finns—have blonde or light chestnut-coloured hair with bluish or light brown eyes and white or slightly tawny skins. Oatmeal with vegetables forms the staple of their diet; they have cattle, and game is fairly plentiful in their country. Milk and flesh are

much more frequently used by them than by the neighbouring Russians. The Permians and Votyaks are similar physically to the Tcheremiss and Mordvins, though somewhat darker in colour; their food supply is almost the same. All these peoples are well supplied with salt: west, there are the springs of Nijni-Novgorod; east, those of Perm and the salt mines of Orenburg; south, Lake Elton in the Government of Saratow and the salt lakes between the Volga and Don.

Along the north coast of Africa, from Western Morocco to the Libyan desert, live peoples whose fair skin, fair eyes and hair differentiate them from all the other inhabitants of that vast continent. 'These Berber populations,' says Keane, 'forming the true indigenous element throughout North Africa, are essentially Europeans.' The Kabyles of the Mauritanian uplands have, many of them, a fair complexion and blonde hair; the Riffs of North Morocco are for the most part fair, with blue eyes and yellow beards; the Chaonias, to the north-west of the Jeb Aures, are one-eighth of them blonde. Sergi finds a blonde element among the Bedouins of the Libyan desert. All live by agriculture and the tending of their flocks. Barley porridge is the staple food of the great majority—towards the desert its place is taken by the date; peas, beans, and green vegetables are abundant, and from their cattle they obtain milk and butter; flesh is only eaten by the poorer classes at times of festival.

Morocco and Algeria are both rich in salt. 'Rock salt occurs in the mountains north of Fez, in the valley of the Martil, and probably in Jebel Zashum. In several places, as in the route from Saffi to Morocco, are brine lakes, from which the salt is collected and exported as far as Central Africa.' There are mines of rock salt on the coast of Algiers east and west of Ain Temushent; the lake of Arzeu, exploited from time immemorial, yields annually 3,000 tons, and the saline lakes Zahrez Rharbi, Zahrez Shergui, Shott Melrhir, Shott Jerid, and many others offer inexhaustible supplies to those encamped near their shores. And in the desert

itself salt is found : caravans laden with the treasure have marked the routes from the rock salt deposits of Taudeni, the mines and saline waters of Bilma and the lakes of Kufra to all the chief parts of Northern and Western Africa. For, after gold, salt is the most valued article of commerce : from the earliest times these two minerals have been the principal medium of exchange in all the riverain countries of the Niger.

IV

The Far East

The vast majority of mankind have black hair, and eyes showing various shades of brown : among these, the most certain differentia in respect of pigmentation is skin colour. It is not only the Europeans who experience a deepening of colour under the influence of intense sunlight ; few even of the very darkly pigmented remain unaffected, and data regarding the same peoples vary in consequence.

In the extreme east and south-east of Asia are found the so-called yellow races. Of these, the Japanese are the fairest : their faces are sallow or yellowish, but their bodies exposed for the bath are quite white. The Coreans have complexions varying from a swarthy olive to very light brunette ; they are not so dark or so yellow as the Chinese, who, while mostly yellow or olive like a Southern Spaniard, in the north are almost white. The Cochin Chinese are pale yellow, or, like the Chinese of the leisured classes, almost white ; the Tongkingese are a little darker ; the people of Annam are light yellow or almost white ; the Thais of Siam are olive ; the people of Laos, café au lait to almost white ; the Tibetans, tawny, varying, however, from a light chocolate colour to the hue of a Southern Italian ; the Mongols, yellow-brown to a white-citron.

The staple food of the Japanese is rice ; at one time

even the revenue of their country was estimated in terms of rice. But the poorer classes have often to content themselves with various pulses and vegetables, indigestible from their coarse pickling. Salt fish, raw or almost raw, forms part of the daily fare of the peasantry, but flesh is seldom eaten. At Yakate, a town of 10,000 inhabitants, a bullock, killed every Thursday, served the needs of the people: fowls are common, but the Buddhist creed protects them also, and their eggs only are used. Salt is obtained by the evaporation of sea water, especially on the south coasts. There is no government monopoly, and the average amount consumed by each head of the population is 9·7 lb.

The staple of the Coreans also is rice; they have turnips, beans and green herbs. But they differ from the Japanese in their much larger consumption of flesh. Game abounds; beef,[1] pork, venison, and chickens are regularly sold in the markets—though indeed the Coreans will eat any flesh meat, even that of rats, weasels, crows, or magpies. They make much use of fish, dried or salted. The coast line is long and salterns are numerous. Fish is salted before being carried inland; the leaves of a radish pickled in brine form an important article of the peasant's winter diet, and the use of seaweed, freshly salted, is very common.

The diet of the Chinese has been described already. A few words concerning their salt supply should be added. According to ancient documents, the art of extracting salt from sea water was discovered in the twenty-seventh century B.C. By the year 110 B.C. the commerce in salt had become very important and mandarins were appointed to regulate and exact the government tax on its sale. At the present day there are thirteen salt-bearing districts, and with each is associated a district where its produce can be sold for the use of the people. Mandarins numbering 194 in their fourteen degrees look after the salt affairs of the empire. The government monopoly is guarded

[1] The butcher's meat retains most of the blood. In the killing, the throat is cut, a peg is inserted, and the animal is beaten on the rump till it expires. This process requires an hour.

by very severe laws : Whoever is guilty of the clandestine sale of salt, whatever its quantity, is punished with three years' exile, 100 blows of the rod, and confiscation of the salt ; whoever, for the purpose of such sale, shows the way to another or acts as intermediary or depository, is exiled for two and a half years and receives ninety blows of the rod. Yet thought is taken for the poor people who live near the sources of supply ; those over 59 years of age or under 16 years, or those who are deprived of an organ or a limb, whatever their age, and old women without means of subsistence, may each day take 40 lb. of salt and peddle it round the country. The average consumption per head per annum is probably 10·8 lb. or thereabouts.

The people of Cochin China, Tongking and Annam live almost solely on rice, with which they consume, as condiment, salted and fermented fish. In 1866 the whole of Cochin China was ceded to France, and in 1884, by treaty, the French protectorate was extended over Annam and Tongking. A tax was levied on all salt consumed in these three territories, a tax which, while it weighed lightly in Tongking and Cochin China, where rates of transport had already made the costs very high, had disastrous results in Annam, whose long line of coast gave every opportunity to salt makers and fishermen. It is probable, therefore, that the average yearly quantity of 6·3 lb. used by each head of population, calculated from the budget of 1899, is a minimum quantity, and that in the days of independence the consumption was considerably greater than this figure indicates.

Like their neighbours, the people of Siam and Laos live almost entirely on rice and fish. 'Namphrik' is a sauce used by all classes in Siam, and is prepared by mixing red pepper and water with shrimps, prawns, black pepper, garlic, onions, a small quantity of brine and citron juice. 'The Eastern plains produce alternate crops of rice and salt. The rains dissolve the salt in the soil and wash it down. In the dry season the salt comes up again and is swept from the surface.' Mons. de la Loubere, writing

in 1687, says that each can make and sell salt without paying anything to the king. In recent times the export has been considerable. Moreover, in the north of Siam, in the hills at Muang Meng, there are mines of rock salt. At Kiang Hai salt from this source sells at fourteen rupees the sen of 266⅔ lb., while English salt brought from Bangkok costs but sixteen rupees per sen, or one penny the pound. Up to 1874 salt passed as coin in the Zimme market.

The fare of the Tibetan is very different from that we have been considering. The basis of his living is the never-ending cup of tea, beaten up with butter and salted, taken with dry morcellated cheese. The chief meal of the evening consists, when possible, of boiled flesh—of dried mutton or yak—eaten with butter-milk. The men of the army carry with them barley meal; this, parched and kneaded with salt to a doughy mess, forms their staple: but in addition they obtain a considerable quantity of meat of one sort or another. It is clear that salt is a condiment universally employed. Salt lakes are numerous over the country, and salt is one of the most important articles of export: its value as such in 1882–3 was £13,978.

Like the Tibetans, the Mongols make great use of tea made palatable with milk, butter, and salt, and occasionally a little flour fried in oil. Until recent times they lived almost entirely on their cattle: now some of them have taken to agriculture with success, others obtain their barley meal by barter. The Mongols are allowed by the Imperial Government to manufacture salt from the salt lakes and sell it to the Chinese, paying tax, however, when they come within the wall.

V

India

Sir Herbert Risley, in his work on 'The People of India,' writes as follows respecting pigmentation: 'At one end of the scale we have the dead black of the Andamanese, the

colour of a blackened stove before it has been polished, and the somewhat brighter black of the Dravidians of Southern India, which has aptly been compared to the colour of strong coffee unmixed with milk. Of the Irulas of the Nilgiri jungles some South Indian humorist is reported to have said that charcoal leaves a white mark on them. At the other end one may place the polished ivory skin of the typical Kashmiri beauty, and the very light-coloured brown—"wheat coloured" is the common vernacular description—of the higher castes of Upper India, which Emil Schmidt compares to milk just tinged with coffee, and describes as hardly darker than is found in members of the southern races of South Europe. Between these extremes we find countless shades of brown, darker or lighter, transparent or opaque, frequently tending towards yellow, more rarely approaching a reddish tint. . . . Throughout India the eyes are almost invariably dark brown. Occasional instances of grey eyes are found among the Konkanas, the Brahmans of Bombay, and the combination of blue eyes, auburn hair, and reddish blonde complexion is met with on the north-west frontier. On the Malabar coast in the south Mr. Thurston has noticed several instances of pale blue and grey eyes combined with a dark complexion.'

Risley, after considering the primary or more permanent physical characteristics—colour he regards as secondary—distinguishes seven distinctive types in India: they are placed geographically as follows:

I. In the Baluchistan agency and the North-West Frontier Provinces: Complexion fair, eyes mostly dark, but occasionally grey.
II. In the Punjab, Rajputana and Kashmir: Complexion fair, eyes dark.
III. In Western India: Complexion fair.
IV. In the United Provinces of Agra and Oude, in parts of Rajputana, in Bihar and Ceylon: Complexion lightish brown to black.
V. In Lower Bengal and Orissa: Complexion dark.

VI. In the Himalayas, Nepal, Assam and Burma: Complexion dark with a yellowish tinge.

VII. From Ceylon to the Valley of the Ganges and pervading the whole of Madras, Hyderabad, the Central Provinces, most of Central India and Chutia Nagpur: Complexion, very dark, approaching black.

Natives of India as a rule take two meals in the day, at noon and at sunset. It is only on the banks and deltas of the great rivers that the poorer classes eat rice as their staple: their common dish consists of the various forms of millet, of maize, and sometimes of barley. With this they take pulses and vegetables in the form of curry, oil, and occasionally milk. The higher caste Hindus are rigid vegetarians, the lower castes and the Mussulmans eat flesh when their means allow them. In Baluchistan, Assam and Nepal the quantity of flesh consumed is greater than in other parts of India; a preparation of salted fish forms part of every Burmese meal, while dried fish and dates are the staples of the Makran.

The quantity of salt consumed per annum by each head of population is 12 lb., 10 lb., 10·8 lb., following different authorities; it varies[1] from province to province and from decade to decade. But we learn little from present-day statistics regarding the salt consumption of past centuries: the advent of railways and the importation of foreign salt have completely revolutionised conditions of porterage and costs in districts removed from the places of manufacture.

[1] The following are quantities in lb. avoirdupois quoted in the Imperial Gazetteer of India, Provincial series, Calcutta, 1908:

Punjab, 6¾ (1881).	Central Provs., 8 (1881).
N.-W. Frontier Provs., 11·11 (1898–9).	Bengal, 10½ (1880–1).
Bombay, 9·12 (1880–1).	Hyderabad, 9¼ (1881).
Sind, 7·37.	Madras, 12·49 (1880–1).
Agra and Oude, 4·8 (1880–1).	Burma, 12.
	Kashmir, 4.

The figure for Kashmir is calculated from trade with Ladakh; but a very large amount of rock salt is imported from the Punjab, of which apparently no notice is taken.

In a work on Eastern India compiled in 1838 from Government statistics, Montgomery Martin finds that each head of population in Bihar consumes on an average 9·25 lb. of salt per annum, in Shahabad 10·66 lb. But the bulk of the population in Bihar could only obtain 6½ lb. and many 2½ lb.: in Shahabad many obtained but 4½ and many still less. And this was bay salt. Pridham, writing of Ceylon bay salt, says it contained one quarter its weight of mud and sand; that often not more than half the quantity of good salt was procured by evaporation. It is probable, therefore, that the majority of people in Bihar consumed about 5 lb. of good salt, while many consumed but 2 lb. The taxation of salt is a part of the fiscal system which the British Government inherited from the native rulers of India. How hardly the people came by their supply we learn from the following: 'Salt from the Sambhar Lake, the most important source of supply to the North-West Provinces, had to find its way 200 miles through native states, with no roads or bridges, on the backs of pack cattle or camels, and subjected to imposts and exactions and hindrances of every kind, until it came to the greatest hindrance of all, our own customs line. . . . With the means of communication which formerly existed it was physically impossible to bring into Northern India a supply of salt sufficient for the wants of the people. . . . In the Madras and Bengal presidencies, where the duties were lowest and the salt was cheap and abundant, the average consumption of the people per head was double that of the people in Northern India, where salt was dear, the duty high, and the supply limited.' An Indian writer states that 2½ to 5 per cent. of the income of a poor family in Madras goes in the purchase of salt: in the eighteenth century its price inland was four and often eight times that on the coast. Even now in some districts the natives spend as much as one-sixth of their annual earnings in procuring salt.

The richest salt-producing districts of India lie to the north-west of the Indus, in Kashmir and Rajputana, in Sind, around the Rann of Cutch and on the Malabar coast;

the Central Provinces have a source of supply, and there are salterns at Pulikat and Chilka on the Coromandel coast, and on the coast of Ceylon. There is an active salt industry on the coast of Lower Burma ; this salt is used chiefly for curing fish. La-chi-mi (lat. 26° 30′, long. 99°) supplies the country round for hundreds of miles. In Assam, salt is dug out of the earth, and is obtained also by a costly process from numerous brine springs. To-day Liverpool salt competes with the native articles of Bengal and Assam. Salt from Tibet comes to Nepal by two routes.

The Western and Eastern Ghats and the Vindhya Hills, before the days of railways, must have seriously impeded the exchange of commodities between the central or southern plateau and Northern India, on the one hand, and the western coast and, in a lesser degree, the eastern coast, on the other. ' When I went,' says Sir John Strachey, ' to my first station in the North-West Provinces, I was carried about a thousand miles in a box—for a palanquin is nothing better—on men's shoulders, and it took some three weeks to toil through a journey which is now accomplished in two days ; there were no other means of travelling through the richest and most civilised parts of India.' What must have been the conditions of travelling among the vast forests, ridges and hills that make up the Vindhya range, or through the tiger-haunted forests that clothe the lofty Western Ghats ! It was not till they met with Europeans that the Todas, living in isolation on the summits of the Nilgiri Hills in Southern India, came to learn the value of salt ; and it is probable that many other primitive folk likewise living at a distance from centres of distribution were equally ignorant. Thurston has dealt exhaustively with the tribes and castes of Southern India ; he makes singularly few references to the employment of salt in food or religious ceremonial.

All the fairer peoples of India, then, live in or adjacent to the great salt-producing areas, and a supply of this commodity must have been ready to hand since very early times. The supply at Berar is scanty and only served for local consumption, while the produce of the salterns on the

Coromandel coast was spread over the country, westward to the region of the Western Ghats, northward to the frontiers of Bengal.

The civilised peoples of Ceylon—Tamils and Cingalese—live exclusively on rice and curry, made either of fish or vegetables, with fruit. They use but little salt: a high estimate gives each head of population 11 lb. of the native product. For reasons already advanced it is probable that this quantity represents no more than 5 to 6 lb. of pure salt.

VI

Oceania and Australasia

The islands of the Pacific Ocean have been regarded, on grounds that are partly geographic and partly anthropological, as pertaining to three aggregates called respectively Melanesia, Micronesia, and Polynesia. Melanesia includes those islands south of the equator lying between the 130° and 170° lines of longitude: the groups of islands called respectively Marianne, Caroline, Marshall, and Gilbert make up Micronesia: the islands south and east of these with the Sandwich group belong to Polynesia. The Melanesians are the darkest, the Polynesians, with the exception of those living on the Fiji Islands, are the fairest. In the present section these peoples, with the peoples of the Malay Archipelago and of the great land masses adjacent, including Australia, are considered respectively in the order of increasing pigmentation.

How fair the Polynesians are appears from the following:

Cook Islanders .	. Yellow-brown; often little darker than South Europeans.
Easter Islanders	. Like Spaniards; darker than other Polynesians.

Sandwich Islanders .	A sort of olive colour and sometimes reddish brown; a little darker than Tongans or Marquesans.
Samoans . .	Often not darker than sunburnt Southern Europeans; bronzed white.
Tahitians . .	European white; almost as white as Europeans; like Mulattos, the women often showing red in their cheeks.
Tongans . . .	Deep red-brown; reddish brownish black: the same colour as Samoans, however, under similar circumstances.
Marquesans . .	Little different from Southern Europeans; almost white; some as light as European workmen, with women not darker than American brunettes.
Paumotuans . .	Away from their islands they become lighter than the inhabitants of the elevated isles; like Tahitians; darker than other Polynesians.
Union Islanders .	Like the Samoans, but lighter; fairest of the Polynesians.
Ellice Islanders . .	Light brown; under the loin cloth exceedingly light; a sunburnt white.

Such are travellers' impressions, interpreted in terms of well-known standards of colour in Europe. I have read of no similar impressions relating to the denizens of the Pacific islands outside Polynesia.

Much the greater proportion of the food of these islanders is vegetable—cocoanut, bread fruit, yams, and taro. Flesh—of the wild pig, domestic fowl or turtle—is a dainty reserved for feasts or for the meals of chiefs and their immediate circle; but fish and shell-fish are abundant, and are eaten, very frequently raw, by all classes.

The Polynesians, says Meinicke, take no salt with their food; they replace it by salt water. According to Waitz they did know salt; it was their greatest delicacy, one to be reserved for feasts or the entertainment of strangers. The preparation of a thimbleful would occupy five or six Marquesan girls the greater part of the day. Pickering visiting the Sandwich group in 1840 found that salt, 'manufactured principally from sea water, had become an important article of exportation to the countries on the Pacific from

Chili to Kamschatka ' ; that ' salt had been always used to cure pork and fish.'

The manner of taking salt water is thus described in Captain Cook's account of Tahiti : ' The chiefs generally sat alone . . . leaves of trees serve as a tablecloth ; and their attendants, who are numerous, having placed a basket before the chiefs, containing their provisions, and a cocoanut-shell of fresh and salt water, seat themselves round them. They then begin by washing their mouth and hands, after which they eat a mouthful of bread fruit and fish, dipped in salt water, alternately, till the whole is consumed, taking a sip of salt water likewise between almost every morsel.' The drinking of half a pint of salt water each day would bring directly into the system some 7½ lb. of salt during the year. Tahiti, which, with the exception of some of the Sandwich islands, is the widest of these Polynesian islands, is nowhere more than twenty miles across : there is nothing to restrict even the poorest therefore in a moderate consumption of salt water or the procurement of fish.

The Maoris of New Zealand show considerable variation in their colour. Cook said of them they were mostly lighter than Spaniards, Diffenbach that they were mostly light brown, though many were fairer than the people of Southern France ; Thomson found, in 100 cases, 87 brown, 10 red-brown, and 3 black. Their food is in great part vegetable, consisting of fern and kumara roots, of taro and various fruits, but there is no scarcity of fish and shell-fish, fresh or preserved, either on the coast or inland. The largest villages are on the sea-coast, and all the settlements are within easy reach of some productive lake, eel weir, or arm of the sea. The Maoris did not know salt as such, nor did they drink salt water ; but they consumed large quantities of dried fish prepared by frequent steeping in the sea. ' After living myself for ten days without salt,' says Thomson, ' one of these fish tasted to me quite salt.' Sweet potatoes were preserved in the same manner. All the tribes inland possessing property on the sea-coast annually resorted thither for the purpose of drying fish ; and tribes around Lake Taupo, who had no such property, exchanged mats for

dried sea fish. Much of the shell-fish was only to be got by diving, an art in which the women were very expert, and this practice must have caused the taking in of often repeated, if small, doses of salt. Certain varieties of seaweed were used as food.

When the Spaniards took possession of the Marianne islands they found there a people called Chamorro. Under the new régime the numbers of Chamorro decreased so rapidly that, in 1741, it was enacted that every two years five or six Tagal families should be brought over from the Philippines. The Chamorro were light brown or olive in colour, the old time Tagals of a coppery red : the present-day inhabitants of the Marianne islands, though darker than the Chamorro, are not yet spoken of as dark. The peoples of the Carolines differ much in colour from island to island, but in general are darker than the Polynesians ; and the inhabitants of the Marshall and Gilbert groups are darker still—chestnut-brown, Hager calls them.

The Chamorro, before the coming of the Spaniards, depended mainly on bread-fruit and cocoanut for their subsistence, as the Caroline peoples do to-day ; the staples of the Marshall and Gilbert islanders are the fruits of the pandanus and bread-fruit trees. All are skilful fishermen and keep themselves supplied with a daily portion of fish and shell-fish ; in the Western Carolines these are preserved by smoking.

The Chamorro procured salt from rock crevices on their coast and used it in the preservation of fish and bread-fruit : to-day their descendants obtain it in small quantities directly from sea water. In the Carolines, Marshall islands and Gilberts salt as such is unknown, but the Pelew islanders occasionally cook their fish in salt water. The Marshall[1] islanders depend for water on rain water that collects in sundry pools and by reason of the porous bottom soon becomes salty. Moreover they use sea water in the preservation of their bread-fruit. Bathing for amusement, or to procure food, is part of the life of all these islanders.

[1] Kotzebue says that the people of Otdia, in the Marshalls, almost totally neglect fishing.

It seems likely then that the Chamorro took at least as much salt as the Maoris, and that in the Carolines, Marshall and Gilbert islands much less is consumed than in Polynesia. If the Caroline islanders preserve their breadfruit in the same way as their neighbours do, or the Marshalls, if too their consumption of fish is greater, as their art of curing suggests, their intake of salt will be correspondingly greater.

Before passing to Malaysia it will be convenient to consider the peoples of two islands widely separated from each other and from those we have just now been considering.

The Nicobar islands and Madagascar are inhabited by peoples whose skin colour and manner of life are like those of the peoples of the Malay Archipelago. The Nicobarese are fairer than Malays, of a yellowish or reddish brown; the wild tribes of the interior of Great Nicobar, the Shompen, are dull brown. The Malagases are separable by their physique—all speak the same language—into four groups: the Sakalavas, the Betsileo, the Hovas, and the Betsimisaraka. The Sakalavas living on the west and north-east coast vary in colour from copper to dark chocolate, those on the west coast being the darkest; the Betsileos south of the Ankova mountains show different shades of brown; the Betsimisaraka of the east coast are comparatively fair, though darker than the Hovas who occupy the entire central plateau; these Hovas are variously spoken of as yellow, as light olive, as fairer often than Southern Europeans.

The Nicobar islanders of the coast have as their staple food dough made from the pandanus nut; and they have also fish and shell-fish in abundance, with sometimes chicken and pork: the wilder inland tribes have no sea fish. Among the coast peoples salt is not greatly sought after and is frequently replaced by sea water; on Kar Nicobar, the northernmost island, even swine are given this to drink.

In Madagascar, except among the dark peoples of the west and south, where maize, manioc, sweet potatoes, and arrowroot furnish the staple fare, rice is the mainstay of the people; everything else, even the occasional round of beef,

is considered only as an accompaniment. Whatever salt is used is thrown in during the cooking process, and the supply of this is confined in its distribution and often very limited. The bulk of it nowadays is unshipped at ports on the eastern coast; the Sakalavas take little of this salt, contenting themselves with the impure substance they make themselves—they can make but little, for neither Ellis nor Grandidier make any mention of the industry. The Hovas, however, have long taken salt in large quantities from the marshes of Diego Suarez on the northernmost coast of the island, and from the saline marshes in the estuary of the Betsiboka river. And it is in Ankova, at the capital and other thickly populated parts, that the markets for this substance are found. In the country of the Betsileo there are brackish springs and often incrustations of salt to which the people drive their cattle; here too they cultivate a species of flag, the ashes of which yield a supply of salt that is sold at great profit.

'The inhabitants of the Malay Peninsula,' says Wallace, 'of Sumatra, of Java, of Celebes and of the Philippines, do not differ more in colour from each other than do the people of the different countries of Europe.'

The peoples on the west and northern coasts of Borneo and the Poonans of the interior are yellowish brown to white, so are Nias and Sulu islanders and those living about Macassar and Minahassa in Celebes. In the Philippines and the Malay Peninsula, in Sumatra, Java, Bali, Lombok, Sumbawa, Gilolo, the Mentawei Archipelago, and the greater part of Borneo, skin colour is of a light reddish brown with an olive tinge. In the interior of Celebes, in Sumba, Flores, Savu, Roti, and Timor it is dusky brown. The Semang and Sakai in the south of the Malay Peninsula, the islanders of Buru, Ceram, Kei, Aru, and Timorlaut are dark brown.

With few exceptions these peoples depend for their subsistence on rice and a fair portion of wild and cultivated fruits and roots. The Mentawei islanders and the coast dwellers of Ceram eat, as their staple, sago, seasoned with

sea water or salt ; but besides these it is only those of dark complexion, the islanders of Kei and Aru, of Timorlaut, of Palawan, and the wild tribes of the Malay Peninsula who, having little or no rice, are forced to maintain themselves on roots and fruits, on the pith of the sago palm, or on arrow-root. Few are so poor that they cannot afford fish in one form or another, fresh from sea or river or salted from the coast districts. Animal food is with most a luxury, though the inland tribes of the larger islands will frequently succeed in killing sufficient game to support them during some days, while those on the coast secure quantities of turtle.

Salt is an essential ingredient of daily food over the greater part of the Archipelago, yet no general statement will give a fair idea of the quantities which are available in different islands or in different parts of the greater land areas. In Borneo brine springs occur in considerable numbers and widely scattered, and were formerly used by the natives for the preparation of salt ; in some places the water itself served to season their dishes, being carried great distances in bamboo canes. On the east coast, from Point Selatan to the northern extremity of the island, there is no place where the natives manufacture an ounce of salt or where they can possibly dispense with the article. Salt arrives weekly, sometimes daily, in Bugis prows from Macassar : in the five years preceding 1831, 2,700,000 lb. came annually in this manner to the mouth of the Kutei river. No crime, however enormous, was refused if, by its committal, the perpetrators could win the right to purchase salt at a reasonable price. And so it is in North-Western Borneo : 'A Dyak once having eaten salt can never do without it ; this article tames a savage more than aught else human or divine.' Here salt is made by evaporating the water of brine springs—the Munets do the bulk of their trading in salt—by evaporating sea water, and by burning seaweed, the roots of the banyan tree or branches of the Nipa palm, and lixiviating the ash. The Sea Dyaks, Land Dyaks and Dusun preserve their flesh food by rubbing it with salt ; the Sea Dyaks pickle their fish with sea water.

The Poonans, living in the wooded districts of Central Borneo, have, as their staple foods, wild fruits and flesh, of birds, monkeys, boars, or serpents. To them salt is a luxury.

The Sulu islanders eat much fish with their rice; their principal manufacture is a salt which they obtain from the lye of burnt seaweeds.

Macassar in the Celebes is a centre of the salt industry: the Bugis not only carry it to the neighbouring coast of Borneo, but distribute it among the poorer people of Mandhar as part payment for their labour in collecting sago. In Minahassa, too, at the northern extremity of the island, salt is manufactured by evaporating sea water. To what extent the Bugis[1] in the centre of the island are provided with salt I do not know: the brothers Sarasin carried salt and dried sea fish for their Bugis carriers; such was therefore probably part of their normal fare. But distances from the sea coast and the difficult nature of the country must seriously diminish the supply of salt inland.

The people of Luzon in the Philippine islands—I do not speak here of the negritos—are, the great majority of them, of a light reddish brown colour; the Iggorots of Bontoc are some shades darker. The use of salt is widely diffused, the quantities at command are in many places considerable. The Ilocanos on the north-west coast obtain it by evaporating sea water and supply the parts north of Bontoc. In the Bontoc area there are springs of brackish water from which the salt is obtained by a tedious process: the 152 salt-houses employ half the population of this region. This salt is bartered east and west, and in some places little remains for the Iggorots themselves. In the south there is a salt mine; to the north-west there are brine springs. The Tagals of central Luzon acquire sufficient salt to season their rice and to preserve some of the fish which forms part of their diet; and so too the Vicals in the southern part of the island.

The Bataks of the mountains in Palawan live principally by the chase and the digging of wild roots, consuming at one time of the year great quantities of honey and young

[1] They are darker than the Macassars.

bees ; their neighbours of the Kalamianes take fresh sea-weed as a seasoning to their diet of rice, fish, and cacao. The Manquianes, semi-nomads in the interior of the island of Mindoro, fairer than the Bataks but darker than the people of Luzon, are poorly provided with salt. Savage Landor tells of their offering a boat in exchange for a handful.

In Mindanao, the Guiangas of the south coast extract salt from sea water on a large scale, and so too do the islanders of the Samal Archipelago.

The manufacture and exportation of salt from Java in historic times has been always an important business of the indigenes : thousands of small vessels from different parts of the Archipelago come here to obtain freights of salt. Over the whole country there are houses for storing it, and 400,000 tons or thereabouts are kept in hand by the Government against the year when excessive rain shall prevent its normal manufacture. One authority gives 12–14 lb. as the amount used per head per annum, another 14½ lb., another gives data for each of the separate departments, from which 7·8 lb. appears to be the average consumption. Much salt is used in various preparations of fish, flesh, and eggs : it may be that this is included in the first two estimates and not in the third, which in this case would represent most fairly the value sought. It is probable that 7·8 lb. is a maximum figure, for the Javanese habit of buying salt for each meal and throwing away what remains would scarcely allow of more than three-quarters, or 6 lb., being actually consumed.

In Sumatra, salt is an article of general consumption. Some of the natives make it themselves by pouring sea water on to burning wood, but this salt by reason of its deliquescence is confined to the parts bordering on the sea. The bulk is imported from the Coromandel coast, from Java, Bali and Celebes. In Battaland the shore natives exchange their benzoin, camphor and cassia for salt among other things, and with this they trade inland. Every year in the Bay of Tapanuli some 500,000 lb. of salt are unloaded. Early history speaks of the immense traffic in this substance on the northern coast. Thirty or forty large Bugis prows

entered the Siak river each year, ships too from Java and Coromandel: there must have been an annual supply from these sources of 2,500 tons, which, in 1881, would have allowed a consumption of something like 2 lb. per head. But indeed there are few ports on the north or on the south coast that do not receive an annual supply also. Expensive it is, but no more so than in the coastal regions of Java.

In the island of Nias,[1] salt is in common use; in the Mentawei Archipelago, though they have no salt as such, they consume considerable quantities in the sea water which, mixed with sago, constitutes their staple dish 'Klads.' In the island of Engano the people do not use salt: they are of a dark red-brown complexion.

In the island of Bali, salt of good quality is made on a large scale on different parts of the coast: it is used for salting beef and eggs, and much is exported. It is very probable that the neighbouring island of Lombok, skilfully cultivated and with ways of communication frequent and good, is well enough off for this substance.

With respect to those Malaysian peoples who are classed as dusky brown to dark brown, the Timorese make their own salt, but there is little evidence that it is a common commodity. Maize is the staple food of the poorer classes, and during part of the year they live on the sugar of a palm or on sago. The natives are timid sailors and little fish is eaten.

The people of Ceram live on sago and fish; with them as with their neighbours on the island of Buru salt is a delicacy much sought after: nobody understands the method of its preparation. True, some, living on the coast, obtain a fairly constant supply to mix with their sago; such are those whom Wallace describes as being light like the Malay. The Amboinese, many of them also comparatively fair, take salt inadvertently with their daily fare of sago and fish, for the water on their porous island is all more or less brackish; moreover, they all take care to give their teeth a daily scour with sea water.

[1] The Nias islanders are spoken of as lighter than Portuguese and Spaniards; the Mentawei islanders as yellow-olive to yellow-brown.

I do not read of any salt being taken with the sago of the Aru or Kei islanders or with the mashed maize and manioc, the common dish on Timorlaut, nor of fish being procured in any quantity. And like these in the east, the Sakai and Semang in the west, on the Malay Peninsula, are without salt, and they too will only trouble to procure fish or flesh when the manioc and other wild roots and fruits are all expended.

In the Papuan Archipelago pigmentation varies between the extremes of copper and deep black. Over the whole of this region rice is almost unknown ; it is the sago swamp, the yam, taro, and bread-fruit gardens that furnish the natives with their staple food. Their diet is essentially vegetarian ; such flesh as there is, of forest game, domestic animal, or turtle, finds its way to the chieftain's table, the common folk contenting themselves with a portion of fish or shell-fish, or it may be with bats, mice, birds, spiders, and suchlike. Salt, says Meinicke, they never use.

The preparation of sago and taro leads necessarily to the loss of soluble salts. 'The pith of the sago tree is beaten small in water, squeezed in water, and strained through bags of grass woven for the purpose. The sago settles at the bottom of the water and is afterwards dried in the sun and packed in long sausage-shaped parcels of umbrella-palm leaf and hung in the house till required.' The root of taro—*arum esculentum*—is poisonous ; to prepare it for food it is either cut in pieces and washed thoroughly in water or it is first roasted and then beaten to a paste in water.

Copper-coloured people are found on the islands in the Torres Straits, and in the Louisiade and Dentrecasteaux Archipelago, on the Loyalty Islands, on Erronan and Immer among the New Hebrides, in the Faed group, and on Bellona, one of the Solomon islands. All of these islands are small, absolutely or relatively to the neighbouring land masses. To each one of their inhabitants the opportunities for gathering the produce of the sea are many, or at any rate

more than fall to the lot of their neighbours. The amount of salt taken in their food is therefore absolutely or relatively considerable. There are others, too, in New Guinea, of a coppery complexion, the Tapiro pygmies and the natives about Port Moresby. The former live largely by the produce of the chase, the latter, many of them, almost exclusively on fish. The peoples inland eke out their vegetable fare with game, some of which they bring to the coast and barter there for fish or pottery. On arriving at the seashore they will drink large quantities of salt water and carry home further supplies in their bamboo vessels: no greater treat can be given them than a supply of crystalline salt.

But the great majority of natives in east New Guinea, and on the Onin and the Berau Peninsular in the west, are dark brown. Those on the northern coast and inland, east and west of Humboldt Bay, are brownish black, those on the southern coast to the Gulf of Papua even darker. 'Salt is not used in Humboldt Bay nor on Lake Sentani; the food is prepared with fresh water. True, the salt which Bink gave the people of Lake Sentani to taste was much appreciated by them, whilst the short distance from the Lake to Jotéfa Bay (two hours on foot) would offer no impediment to fetching salt water; but they apparently did not think it worth the trouble. There is no mention of a regular salt industry by evaporation. On the other hand, the inhabitants of Astrolabe Bay, according to Biro, often walk about sucking a piece of charred wood, and they have special bamboo cases in which to preserve the ashes. But this salt, according to Hagen, must be used quickly after preparation, as it liquefies very rapidly. Many of the natives inland are equally fond of salt, and carry back with them, when they return from the markets along the coast, bamboos filled with sea water, in the same way as do the people of Arfak on the Berau Peninsula, according to Van Rosenberg. Van der Goes noticed the use of salt water in the sago porridge at Dorei; here too the ashes of beech wood saturated with sea water are added to the food. It appears, therefore, from this that Humboldt Bay and

surroundings form a saltless territory in the middle of salt consumers to the east as well as to the west.' And the accounts of the British Ornithologists' expedition to the Snowy Mountains in Dutch New Guinea suggest an equally saltless district bordering the southern coast. No mention is made of the drinking of salt water or of the use of salt in any form; and were such a habit contracted locally the vast mangrove swamps, barring access to the sea, would prevent its propagation.

It is the custom too of the natives of New Caledonia and Kunie to drink sea water; the latter take half a pint or so at the early morning bath. And in the northern part of New Britain, though salt is never used with food, it is much prized as a medicine by the inland or bush people, who buy cocoanut-shells and bamboo bottles full of salt water from the shore tribes. Moreover, they have a cake, made from kernels of the tau fruit soaked for some days in salt water. These peoples are of the same dark brown colour as those of eastern New Guinea—the Biaras of New Britain are rather fairer—and so also are the inhabitants of Isabel, Guadalcanar, and San Christoval among the Solomons. I do not read, however, of anything which differentiates the diet of these latter from that of other dwellers in this group.

The inhabitants of New Ireland, west of the Solomons, and of the Santa Cruz and Fiji Islands, are of a brownish black colour; those of the New Hebrides, with exceptions already noticed, are even darker. On Vanua Levu, in the Fijis, Williams found good salt, though of a sandy colour, procured by evaporation and preserved in baskets near the fire. Such salt will not travel, and Meinicke makes no mention of its use in speaking of the islands generally. Pickering says they use very little salt and uniformly manifest dislike on tasting salted provisions. Of the use of salt in any form in the New Hebrides I have read nothing except this in Featherman's 'Social History of Mankind,' that salt water is drunk in considerable quantities. It is unlikely that this is a widespread custom in the group. It is on these islands and these, islands only, of those we are now considering, that the native fisherman is almost solely

dependent on his bow and his spear; the amount of fish consumed therefore is relatively small.

Hitherto we have passed in review peoples who, most of them, show knowledge and forethought sufficient to sow that they may reap and make provision against the day of necessity; many live on islands of size small enough to allow of each obtaining occasional supplies from the sea and beach. It is quite different in Australia. Here are men living solely on the spontaneous offerings of nature, thinking little of the morrow and living well or thinly as chance may ordain. They are wanderers within limits prescribed by the jealousy of their neighbours and their own ignorance; in a fresh environment they would starve where the intuition of the native would discover plenty. In the main their food is vegetable. They are so lazy that, in rainy weather, they prefer temporary starvation in their rough shelters to the hardships of the chase. Their life is by no means miserable or very hard. 'I have always found the greatest abundance in their huts,' says Grey. They do not use salt; indeed the saltness of the white man's flesh acted as a deterrent to their cannibal propensities. When, however, facilities were offered them they soon came to appreciate the salt beef of the colonist. Much of their food was cooked folded in leaves between heated stones; and in the preparation of roots, seeds, and fruits considerable care and ingenuity was necessary. Thus on the Lachlan a ready and wholesome food was obtained from the root of a bulrush, in the form of gluten exactly resembling wheaten flour: the root was pulled, partially roasted, its fibres loosened and twisted to allow the gluten to separate. Kadjera, the principal food of the natives about Herbert Vale, from October to December, is prepared from the poisonous fruit of a palm; the kernel has to be pounded, roasted and soaked till all is changed to a white porridge. And equal labour is expended on the 'tobola' and 'koraddan,' the staple food between January and March.

Much of the interior of Australia is an almost waterless

desert; and in the west, within the coastal range, droughts will last through several years, killing off all vegetation that strays beyond the banks of the perennial streams. But the rivers draining New South Wales and Victoria are relatively frequent and broad; great quantities of fish were taken from their waters by the neighbouring tribes—waters which, in times of drought, were often too salt to be drinkable. The aborigines met by Mitchell on the Darling lived almost entirely on fish, fresh-water mussels, ducks, and parrots; those too on the Coorong and other parts of the coast had little else than what came from the sea. Different tribes came to Lake Victoria every year to take from its waters enormous quantities of fish and shell-fish, wasting as much as they consumed. Before the day of the squatter there was no scarcity of game. In all the well-wooded districts, opossums furnished a plentiful supply of animal food, five to fifteen of these animals rewarding a day's hunt in company. And there were kangaroos and wallabies, snakes, lizards, and grubs. The natives near Sydney consumed as much flesh in the year as any two Englishmen. With yams, roots, sour thistles, water-grass, and various fruits, in addition to flesh, there was no stint. In a native oven on the banks of the Murrumbidgee, Mathew found half a ton of roots, cooked by several days' heating and beautifully white and palatable. The natives of what is now Victoria and New South Wales were copper coloured.

Among the dark brown peoples of Queensland and Central and Northern Australia the food is almost entirely vegetable. It is the women who provide the daily food; they never move any distance without their digging stick. The husband's contribution to the household is chiefly honey, but occasionally he provides eggs, game, lizards, and the like. Very often, however, he keeps the animal food for himself. After the wet season vegetable food is plentiful. Palmer gives an account of fifty-nine species of fruits, roots, and vegetables, and seven species of seeds, all of which, raw or cooked, are eaten by the natives. Five of the former and three of the latter require

most careful treatment before they are fit for use. In Central and Northern Australia the only food seen in camp was, often, the raw or slightly roasted pods of an acacia. The natives were never in want of some form of vegetable, and in the first stages of pregnancy a woman ate nothing else. In these districts there were elaborate codes of food restrictions, insisted upon by the older men, that they might never be left without the good things of life. A man is usually well on in years before he is allowed to eat wild turkey, rabbit, bandicoot, and emu. Neither in Queensland nor in Central Australia is fish taken in any quantity ; in the northern districts crayfish constitute a favourite, though by no means common, food.

George Grey, in his journals, gives a long list of the animal and vegetable foods which he found in use among the dark brown aborigines of Western and North-Western Australia ; he mentions kangaroo, fish, shell-fish, turtle, frogs, grubs, snakes, twenty-nine species of roots, gum, manna nuts, and many other things. He recounts at considerable length the native methods of killing game, fish, flesh, and fowl, and for a moment the impression remains that these western aborigines must have lived, in the main, on a carnivorous diet. Grey did not travel far from the coast, and came more frequently in contact with the taking of fish and shell-fish than he otherwise would. For most of the rivers that enter the western sea spring near to the coast and, although the aborigines were everywhere wanderers, 'their wanderings are circumscribed by certain well-defined limits, beyond which they seldom pass, except for purposes of war or festivity. In short every tribe has its own district, the boundaries of which are well known to the natives generally.' Such festivity occurred whenever a whale was stranded ; they gathered from all sides and stayed gorging themselves long after the flesh became putrid. This does not suggest great plenitude of flesh food under ordinary circumstances. The natives have ample supplies of vegetable food. There is no time of the year when some root is not in season, and they regulate their visits to the different districts accordingly.

And they are shrewd enough to enforce a law that no plant, bearing seeds, is to be dug up after it has flowered. It is probable that away from the sea-coast flesh food is the *bonne bouche* of the older men, preparations of roots, seeds, and nuts the staple of the majority.

'Although,' says Grey, 'the natives could in many districts procure native salt, and most certainly, from its abundance, cannot be unacquainted with it, they never use it, until they have seen Europeans do so, and even then do not at first like it.'

Tasmania has an area somewhat less than that of Scotland. It is mountainous, hill and dale succeeding each other to the central tableland, and it is well watered. In the east the climate is most genial; in the west the rainfall is heavy, and dense forests obstruct the way of colonist and traveller. It was in the less densely wooded central and eastern areas that the Tasmanians mostly lived, camping always by the side of streams, that they might have a plentiful supply of water. Like the Australians they were very tenacious of their hunting grounds. In estimating their means of subsistence one must be guided by the same thoughts that brought us above to regard the Western Australians as in the main vegetable feeders. Early travellers following the line of shore saw much eating of shell-fish, heard much, doubtless, and saw something of the kangaroo and opossum, and dilated on these facts as being most interesting. It is probable, however, that the natives depended on vegetable food as much as, or even more than, any inhabitant of New Holland. Their methods of obtaining the kangaroo, by burning the undergrowth or driving on a large scale, would soon have destroyed the species if constantly employed and constantly successful. The taking of the opossum was a work of great skill and required much time. Fish they never killed for food, and the take of shell-fish, gathered from the sea bottom by their women, was dependent on the weather. Shell-fish was never carried far inland; there are no traces of any shell mounds at a greater distance from the coast than

two to three miles. Moreover the visit to the sea-coast was only an incident in their periodical migration: according to one writer they visited the coast but seldom. On the other hand they had a fertile soil, offering supplies of vegetable food, for them inexhaustible. With their shell-fish they mixed the pith of a fern tree, and with their roasted kangaroo they ate the root of the 'tara,' taking it as the Europeans take bread. At one time of the year they procured great abundance of a kind of truffle called native bread. The young shoots of the tara fern, and the roots of a bulrush, raw or slightly roasted, were eaten freely. Indeed the food plants used by the Tasmanians were as numerous and as varied as those of Queensland or Western Australia, and the preparation of many of them demanded no less patience and skill. The colour of these people is generally spoken of as dark brown to a dull black—considerably darker than those in the interior of New South Wales, says one authority; 'a few are of a lighter hue, approaching to the colour of copper.'

To return to the Philippines: the Negritos—Aetas they are commonly called—wander in small isolated groups over the more inaccessible parts of Luzon, Panay, Negros, Palawan, and some other of the islands. In many respects their manner of life is very similar to that which was the lot of the Tasmanians, though, from competition with more powerful races, the food supply is much less abundant. The colour of these Negritos is variously described as brown mixed with black and some red, as dark chocolate-black, as dark copper-brown. Hunters by instinct and necessity, they confine themselves chiefly to the inland districts; at times, however, they visit the coast to collect crayfish and such fish as they can pierce with their arrows. But it is seldom that they obtain flesh food in any quantity; it is usually snakes and frogs, with some few fish from the rivers, that vary their staple diet of wild fruit, roots, and honey. And in the use of these roots experience has taught them caution: some are poisonous when fresh gathered. These they soak for two days, then boil in two or three waters and

finally feed to a dog. Only after the dog has passed safely through this ordeal will they partake of the food themselves. Everything is prepared and eaten without salt, though when the natives can procure this they take it greedily.

VII

Siberia

It is remarkable that the natives sparsely scattered over the vast area of Australia are so nearly alike in colour. The tribes of Siberia, also, wandering within circumscribed limits, separated many of them by thousands of miles, vary no more in colour than between the extremes of yellowish white and light copper. In Australia there is little variation in the manner of living, and so it is, too, in Siberia. Here all live by hunting, fishing, and tending cattle, some more, some less, caring something perhaps to reap, nothing to sow. In respect of uniform complexion over vast areas, in respect also of uniform occupation over vast areas, these two countries are without parallel.

Most of Siberia is plain land, sloping uniformly to the north-west : in the south, fertile prairie ; in the north, vast marshy wastes, called tundras, clothed only with stunted shrubs, mosses and lichens ; between, a belt of well-treed forest land. Its climate is unique. ' The intense heat lasts only a few weeks ; the intense cold for many months. Deep silence broods over the land ; the trees are frozen to the heart ; the axe, which becomes as fragile as glass, makes no impression on them. Rivers are frozen to the bottom ; the mercury freezes. But, in summer, the baked surface of the tundras becomes so hot one cannot walk on it.' Such, too, is the climate in the north of Russia, to the western limits of Lapland. As stated, the tribes show little variation in colour, and if, in collating the following details, one allows for different shades of meaning often attaching to identical words from different pens, the variation appears still less.

People	Colour
Lapps	Light olive-brown.
Samoyedes	Yellowish brown.
Tungus	Dark olive or bronze.
Yukagiris	A little less brown than the Tungus.
Yakuts	Light copper.
Chukchis	Slightly brown : young women almost European in colour.
Kamchadales	Swarthy : deep brown.
Ghiliaks	Some like the Tungus, some like Ainos.
Buriats	Some deep brown, some yellowish brown.
Ostiaks	Swarthy.
Voguls	Not very dark.
Bashkirs	Yellowish brown.

The Ainos of Yezo, of whom one may speak here also, because of the many circumstances they endure in common with the peoples of North Siberia, are variously described as Italian olive in complexion, copper coloured with an olive tinge, almost as light as Europeans. The coast tribes of North Siberia and these Ainos subsist mainly on fish, and they have great plenty of it. ' In the Anadyr river the shoals of salmon ascending the stream drive the water before them like a moving wall. The rivers are so full of fish that one of the ordinary difficulties of the natives is to avoid breaking their nets with the weight of the draught.' Inland the staples are milk, fresh or fermented in the form of koumiss, flesh from the herd, and game. All the tribes take vegetable food of one sort or another. In addition to the wild herbs, roots, and berries, which at one or other season of the year are within everyone's reach, a meagre supply of rye or barley flour is obtained by those Lapps, Yakuts, Bashkirs, and Samoyedes in touch with Russian commerce, while the poorer Lapps and Yakuts in winter time eat the inner bark of the yellow pine tree baked to a bread or mixed with fat.

Bunge's investigation of the elimination of common salt from the human body led him to conclude that men living principally on a flesh diet would not desire the addition of salt to their food. He took great pains to test this con-

clusion and found it almost exactly correct. He does not mention the Yukagiris—according to Cochrane they have no salt—and Bashkirs, but of the rest, only the Voguls and Lapps, he says, made any use of it, and this to a very small extent. But the amount taken indirectly with flesh food is considerable. In the killing of their beasts these nomads take great care of the blood ; the Lapps keep it in kegs or make it into black puddings ; the Samoyedes and Chukchis look on it as the greatest delicacy ; and it is in the blood that the greater quantity of animal salt is found.

An individual living on flesh[1] alone would consume 3–4 lb. of salt per annum, one living on milk alone 10 lb., and on sea fish alone 24–25 lb. The fish eaters of the coast are fairer of complexion than the nomads of the interior, excepting perhaps the Kamchadales.

Dobell speaks of the Yakuts adding salt to their favourite dish of rye flour boiled with butter, and Cochrane says the Kamchadales at times salt their fish and game.

VIII

North America

Much of the information given in this chapter comes from Bancroft's work on the native races of the Pacific States and has to do with peoples as they are now. Tribes that formerly flourished in the eastern country were moved, what remained of them, to reservations in the West : they are placed where civilisation found them. The Toltecs, too, the fair complexioned rulers of old-time Anahuac, are long since gone, but much that is pertinent here is known about them.

[1] Data for the calculation are as follows: Daily rations of flesh, milk, and fish which will meet the physical requirements of men are 3·78, 4·5 and 8·1 lb. respectively. Half-fat ox contains 0·82 per cent. ash, of which 6·4 per cent. is chlorine ; blood, 1 per cent. ash, of which 32·9 per cent. is chlorine ; salmon, 1·39 per cent. ash ; the ash of cod fish contains 38·11 per cent. chlorine ; cow's milk, 71 per cent. ash, of which 31·7 per cent. is chlorine.

The natives of the northern half [1] of the continent have a complexion relatively fair, those towards the coast being indeed little darker than Southern Europeans. On the west coast there is a gradual deepening of shade from the mouth of the river Yukon to the north of California. The food of the northerners is stated to be approximately three-quarters animal, that of the southerners three-quarters vegetable. On the coast the proportion of animal food is necessarily greater than it is inland; for here the stores of the sea are available, as well as those of forest and river. Among the Eskimo indeed vegetable food is little thought of, though at certain seasons of the year they can obtain great quantities of berries. Fish is the staple food, together with the flesh of deer or seal. The food is roasted, boiled, or eaten raw. No salt, as such, was used in earlier times, though now some of the Eskimo are learning to appreciate it; but about the mouth of the Yukon it is customary to boil the flesh of larger game in sea water to give it a salty taste. Moreover, in Greenland they lay by a store of seaweed against hard times. Southwards, among the fair coast tribes, the amount of vegetable food in the diet increases: fish is still the staple food, winter and summer, but a milder climate enables certain roots and fruits to grow in ever-increasing profusion.

The fair townspeoples—Pueblos, the Spaniards called them—settled from time immemorial in the almost barren wastes between the Colorado river and the Rio Grande, are essentially agriculturists, cultivating as their staple crops maize, wheat, and beans. They breed poultry, and take such fish as they can from the rivers; at times they kill deer, hares, and rabbits, though they are but indifferent hunters.

In Central New Mexico there lies an inexhaustible lake of salt, and two days' march to the north of it live the Zunis, the southernmost of the Pueblos. The salt from this lake was of great purity, and the Zunis claimed the sole right of

[1] In the text, tribes are spoken of in the following categories: almost white, yellowish brown, olive brown to copper, chestnut, almost black. White lines separate the several categories.

taking it. And for this right they fought and conquered. The taking of salt had a religious significance among them. They carried it far and wide among the Pueblo towns, sometimes making false gains by adulterating it with salt of a baser sort from the salt marshes in Southern Utah and South-Western Colorado. It has been suggested that the Zunis of old time came down from dwelling among the cliffs, to build and dwell in their round towns along the trail of salt, chiefly, if not wholly, from the desire at once to shorten and render less dangerous their commercial expeditions to the lake of salt.

The fair complexioned Toltecs of Anahuac were, like the Pueblos, an agricultural people. Maize cakes and beans formed their staple diet, to which at times they added game and, more often, fish. Next to chili, salt was the condiment most used. This was, most of it, obtained from the salt lakes in the valley of Mexico, and an inferior salt, impregnated with saltpetre, was scooped up on the flats surrounding the lakes. The Aztec kings had a monopoly of salt, and refused to sell it to any but tributary nations: its protection was the function of a goddess.

The natives of Southern Oaxaca and Tehuantepec eat maize cakes as their staple food, and those living near the sea take large quantities of fish. They have a favourite dish —'tamales'—made of maize, lard, and salt, cooked with finely divided meat. There are rich deposits of rock salt in Oaxaca.

It is a universal belief along the Atlantic coast, from Belize to Aspinwall, that the Frio tribe (the Guatusos on the east of Lake Nicaragua) had white complexions, fair hair, and grey eyes; and the more easterly Blancos are described as the fairest Indians in southern North America. Little is known of these people except that they were agriculturists and lived in touch with a considerable salt trade, carried on by the coast tribes of the Pacific sea-board.

The tribes of Darien have a colour varying between tan and bright yellow. They inhabit a country of great fertility and cultivate plantain, yams, cassava, and cocoa;

they take fish, manatee, and turtle from the sea, deer and wild hogs from the woods. The men of Cueba are celebrated for their manufacture of pure white salt from sea water.

The inland Indians of the north-west, though darker in complexion than the coast tribes, are nevertheless fair compared with other peoples of the continent. During the greater part of the year they have a plentiful supply of food. Lakes and great rivers afford them ample supplies of salmon, their staple food ; in the north, reindeer and other game abound, while farther south, annual expeditions across the Rockies brought them formerly into touch with the enormous herds of buffalo which then roamed over the central prairies. Flesh of fish and beast was sun-dried and put away against the thin time of winter ; roots and berries too were preserved, these at all times of the year making some part of their diet. They did not consume salt as such. The Chippeways were careful not to waste the blood of their game, regarding it, curdled or cooked in the form of a haggis, as a great delicacy. Many tribes obtained much of their fish from the coast, directly or by barter, while others took them from rivers still brackish with tidal water.

Not less fair than the hunters of the north are the Comanches, Apache and Southern Californians, roaming over the fertile buffalo plains of Texas and the barren wilderness of New Mexico, Arizona, and Southern California. The Comanches were known among the Indians as buffalo eaters ; flesh with a few wild plants and roots occasionally picked from the prairie were their sole aliments. The Apache lived by the hunt and such cattle as they could thieve from their neighbours. But their daintiest food was mule and horse-flesh. They refused nothing : if times were hard they would eat rats, frogs, lizards, grasshoppers, and worms ; and these failing also they would eat wild fruits and roots. The Lower Californians are equally catholic in their taste, but they depend more on the vegetable kingdom than either Apache or Comanches. In addition to wild berries and roots, they have a bread made from the well-washed flour of pounded acorns. Many of the inland tribes come down tc the coast in the fishing season and remain

there till the shoals leave ; the coast people in addition to fish and shell-fish take seals, and occasionally they feast off a stranded whale. They have a superstition which prevents them eating large game, but otherwise no living thing is rejected. These Californians eat salt, but very sparingly lest it turn their hair grey ; the Apache and Comanches do not. But all alike show a predilection for blood, sucking it warm from rabbit or buffalo.

The Maya tribes, who, at the time of the Spanish conquest, inhabited Yukatan, and the present-day peoples of Guatemala, Western Nicaragua, and Salvador live by tillage of the ground. Beans and maize cakes, with plantain and bananas, are their staple food ; flesh is reserved for feast days. The use of salt is universal ; it is, and was in the days of Maya power, obtained in Guatemala by washing the sand of the seashore. Bancroft does not mention a similar business on the shores of Yukatan, but it is probable that the civilised peoples of the peninsula took advantage of a climate eminently suited to the preparation of marine salt. At any rate roads were good and trade was keen, and Guatemalan salt must have found its way to most Mayan households. The considerable cost of production would cause it, however, to be taken sparingly. In Central Nicaragua certain tribes still pursue the hunt seriously, and kill the wild hog, tapir, and deer, and these, with cassava cake or gruel, make them a living. They too have salt with which they season their cassava or, at times, cure their game.

On the western shores of Lake Michigan there lived another comparatively fair people, the Menomoni Indians or 'rice men.' 'In the spring they subsist on sugar and fish ; in the summer on fish and game ; in the fall on wild rice and corn ; in the winter on fish and game. Those who are provident have some rice during the winter. The fish, consisting principally of sturgeon and salmon trout, are in the greatest abundance in the bay.' In their new home in Wisconsin, the Menomoni still gather wild rice in large quantities. Salt they do not use, but the reader will recall that rice is the one cereal that contains a large quantity of soda in contra-distinction to potash salts.

To the north as far as Hudson's Bay, and west beyond Lake Athabasca, roamed the Chippeways and Crees. They were darker in complexion than the Menomoni. Their lot was often a hard one. 'Ordinarily they lived by fishing and the chase; they had elans, caribous, bears; but, of all these animals the beaver is the most common. They count themselves right fortunate in the chase if only they meet some hares, martens, or partridges to make into soup; and without a sort of grey moss the bulk of them would die of hunger. One has seen them driven to eat their children, others perish from want. For the country of the north is the least gracious on the earth; in many places there is not a bird to hunt. There is a sort of wild currant, however, which is dried and preserved against the day of need.' Game must have been more plentiful, however, towards the west, for Schoolcraft tells of a noted Chippeway hunter who killed in one day sixteen elk, four buffaloes, five deer, three lynx, and a porcupine. South of Lake Superior, even in early days, the Chippeway cultivated some maize, and the possession of wild rice fields was one of the chief causes of war with the Sioux tribes. We have seen that the western branch of the Chippeway people was relatively fair in complexion.

I do not read of these tribes eating salt, and the quantity taken indirectly with their food can have been but small compared with that consumed by the tribes of British Columbia and Oregon. For the great lakes and the rivers feeding them are fresh; while much of the fish consumed in the west came from the coast and estuaries.

The tribes of the south-east, from the Mississippi to the coast of Florida, were, in the main, vegetarian. True they hunted the bison, deer, and bear, and took fish from the rivers, but the food so acquired did not constitute more than one quarter of the whole. One authority could even say, 'Some [people], like the Natchez, did not have any other means of living (than by agriculture), not being hunters.' Their staple crop was maize, and this was prepared according to any one of forty-two styles; they had also beans, pumpkins, and various fruits, and in times of scarcity

they made bread of wild roots and acorns. For seasoning, the Mississippi tribes used salt: excursions from all parts were made at certain seasons to saline lakes, some miles west of the great river, to replenish their store. On the sea-coast, salt was made by evaporating sea water. Moreover, there was an extensive trade in this substance between the Caddoan tribes of the north-west and those farther east: bands of these traders were often met by the early explorers bringing sacks of their merchandise to market.

Bancroft gives the colour of the northern Mexicans as light brown to copper; Waitz, quoting various authorities, finds it vary between an olive-brown and a reddish, more seldom blackish, brown. The Papagos inhabit a poor country and depend more on wild roots and fruits than do their neighbours: their principal crops are maize and beans. They have long been purveyors of salt to the neighbouring tribes, taking it from a lake near the coast across the boundary of Sonora: native markets are furnished and 20,000 lb. are sold annually to white men. The collecting of salt was attended with much religious ceremonial: did a horse die on the return journey the whole supply was thrown away. The coast people of Sinaloa obtain salt from the land during the dry season, and from pools and marshes during the wet; they consume it in large quantities. The Toltec trade in salt was as widely spread as their empire, moreover the whole of the country of Mexico is well furnished with brine springs: it is probable, therefore, that few lived out of reach of this substance.

The Mandans and Blackfeet of the Upper Mississippi lived almost entirely on the buffalo, 'which seldom, if ever, fails to afford them an abundant and wholesome means of subsistence.' None of these tribes, says Catlin, 'use salt in any way, although their country abounds in salt springs . . . but everywhere along our frontier, where the game of the country has long since been partly destroyed, and the people have become semi-civilised, raising and eating, as we do, a variety of vegetable food, they use a great deal of salt; and in many instances use it even to destructive excess.' On the other hand Featherman says that they season their

meat dishes with salt purchased from traders or procured from the salt lakes.

The Northern Californians, about the Klamath and Trinity rivers, are of a hazel complexion. In the mountains, game was very plentiful, and on this these Indians largely subsisted; but in the immediate neighbourhood of the rivers and Klamath lakes, fish formed the staple diet. They made a bread of corn flour, and gathered roots, berries, and seeds, which, with dried fish, were stored for winter.

The Algonkin Indians of the east coast lived a life very similar to those of the Klamath district. In the north they devoted their energies to fishing and the chase, regarding agriculture as a despicable thing; nevertheless they received some corn from the neighbouring Iroquois in return for dried flesh and skins, and with it made festival. Towards the south, in Virginia and the Carolinas, the Indians grew their own corn, though not in any quantity. On the sea-coast and near the rivers, fish and shell-fish took the place of flesh in great measure, and, after drying, was bartered among the Indians living further inland. According to the Handbook of North American Indians, the diet of these Northern Indians was three-fourths animal. Salt as such was not used.

The inland tribes, whether on the shores of the great lakes, in the Mississippi basin, or away west on the plains of Nevada and Utah, were all, with exception of the Mandans and Blackfeet, of a darker complexion than any we have mentioned as yet. In many respects their modes of living were similar: hunting and fishing were the occupations of the men, agriculture in greater or less degree, according to the nature of the country, the business of the women. Perrot says of the Iroquois, Hurons and neighbouring tribes: 'The aliments they like the most are Indian corn, haricot beans and squashes. If they lack these, they feel that they hunger whatever abundance of flesh they may have by them, Indian corn being to them what bread is to the French.' In a less degree the Ricarees, Minatarees, Pawnees, and some of the Sioux tribes cultivated maize, beans, and squashes;

the Winnebagos and Utes had in addition much root food. But the mainstay in the central and western country, at any rate, was flesh of fish or beast; in former days the prairies supported herds of innumerable buffalo: 'the Snakes of Idaho and Oregon, and the tribes occupying the more fertile parts of Utah, having abundance of fish and game, live well all the year round.'

It is only among the Sioux tribes that I read of any salt being used, and this in small quantities only. The custom cannot have been widespread, otherwise Catlin would not have denied its existence altogether, nor Waitz have missed mention of it in the many authorities he consulted. That the quantity of this substance taken indirectly was less than among the shore seeking Algonkin tribes is obvious.

The Ceris of Tiburon Island and the Sonoran coast, the Lower Californians and tribes of Costa Rica, are similar in complexion to the peoples of whom we have just now spoken, and in many respects lead a similar life: they are alike too in that they take no salt with their food. The Ceris value their vegetable food so highly that, rather than waste the nutriment contained in the undigested seeds of the prickly pear, they collect, dry, grind, and winnow their dung, at the pear season, for a second harvest. A seaweed is eaten in small quantities, and will furnish them indirectly with small quantities of salt.

Respecting the food of the Lower Californians, Baegert[1] says: 'The only period of the year during which the Californians can satisfy their appetite without restraint is the season of the "pitahayas," which ripen in the middle of June and abound for more than eight weeks. The gathering of this fruit may be considered the harvest of the native inhabitants.' They had other vegetable foods also, the roots of the yuca, of the aloe, of a common reed; moreover they consumed various seeds, leaves, and shoots. Baegert continues: 'It can be said that the Californians eat, without exception, all animals they can obtain. Besides the different kinds of larger indigenous quadrupeds and birds, they live nowadays on dogs and cats; horses, asses, and mules;

[1] From a translation in *Bur. Eth. Soc.*, pt. i., 1895–96, p. 209.

item, on owls, mice, and rats ; lizards and snakes ; bats, grasshoppers, and crickets. . . . The chase of game, such as deer and rabbits, furnishes only a small portion of a Californian's provisions. The hunting for snakes, lizards, mice, and field rats, which they practise with great diligence, is by far more profitable and supplies them with a much greater quantity of articles for consumption. Snakes, especially, are a favourite sort of small game, and thousands of them find annually their way into the stomachs of the Californians.' In taking fish and sea turtles they use only a long, slender, pointed piece of hard wood. Their food, such as is not eaten raw, is held in the flame or thrown on the embers and just charred on the outside ; they use no salt, though they could obtain plenty of it.

The Mosquitoes of Honduras and the tribes of Costa Rica and Veragua live in a more favourable environment. Yet the bounty of nature, abetting the natural laziness of man, has stood in the way of any of that agricultural development witnessed among the Pueblo Indians or the tribes in the less genial north. Those living near the shore catch fish and kill many turtles and manatee, those inland pursue the wild hog, tapir, and deer : all, by the hands of their women, plant yams, beans, cassava, and squash. Honduras has a very damp climate, little suited to the preparation or conveyance of marine salt, and I do not find mention of its use except occasionally for preserving fish ; in Costa Rica and Veragua many regard it with contempt.

The Central Californians and the Digger Indians of Nevada stand out among all other tribes of North America by reason of their very dark skin colouration—dark chocolate, often nearly black—and by reason too of the near approach they make to the life of the beast. Though they will greedily devour anything that creeps, runs, flies, or swims, their laziness prevents any whole-hearted pursuit, and they are compelled to depend in the main on acorns, beech nuts, roots, grass seeds, berries, and the like. ' These are eaten both raw and prepared. The acorns are shelled, dried in

the sun, and then pounded into a powder with large stones. From this flour a species of coarse bread is made, which is sometimes flavoured with various kinds of berries or herbs.' Inland savages are passionately fond of salt ; those living near the sea detest it.

IX

South America

The vast forests, great rivers, lofty mountain ranges, and far-stretching pampas of South America all tended to the isolation of its native peoples in small tribal groups, and to preserve the most primitive modes of living. Before the coming of the European the effect of centralised government was felt in one part only of the continent, that stretching from Quito in the north to the river Maule in the south, and bounded on the east by the chain of the Andes, where the national sway of the Incas, with its insistence on agriculture and encouragement of miscegenation, held together a numerous and homogeneous people, the Quichua. Otherwhere the bond of common blood united as many as served for personal security, for efficacy in fishing and the hunt, and for ease in cultivating such crops as would eke out their precarious subsistence. Humboldt says of the South Americans generally—his own travels were, however, confined to what is now Venezuela—that they of all people in the world probably consume the least salt ; Featherman, whose large work, whatever its faults, is a mine of sound information drawn from all the sources to which he had access, mentions salt in two or three places only : so I did not expect to find much that would bear witness to the truth of the thought that less or more pigmentation was co-ordinate with the consumption of more or less salt. There seemed a serious breach in the chain of evidence—yet a survey of the map showed salines in plenty.

The fair tribes—those whose colour is little if at all deeper than that of the Southern European—living now or

in times past at the extreme north or the extreme south, the extreme east or extreme west, in environments very unlike, have this one circumstance in common, easy access to supplies of salt with a diet that is largely animal. Again the tribes less fair—yellowish brown is the colour usually ascribed to them—have these circumstances common to them, a mixed vegetable and animal diet and proximity to natural salines or the sea-coast. The darkest tribes of all—of a colour varying from brown to bronze—are almost entirely vegetarian like the Quichua, with a salt supply evenly distributed over large areas under a tariff, or like the Patagonians subsist on an animal diet, and so make little use of the salt with which their country abounds, or inhabit the saltless basins of the Orinoco and Paraguay.

And this is the evidence. When Columbus first reached the shores of South America he found the natives of Cumana as fair, almost, as Spaniards. The Araya Peninsula has a soil impregnated with salt ; on its coast are lagoons which, periodically closed and exposed to the dehydrating action of the sun, yield supplies of salt that have been drawn upon from the earliest times. Farther south, Humboldt found a fair race of men living on the selvas about Esmeralda and the Rio Ventuari. Here the Indians eat but little meat and consume scarcely any salt as such ; but they incinerate the spadix and fruit of the Seje Palm and so prepare an impure and earthy salt called 'chivi,' a mixture of the chlorides of potassium and sodium with lime. The Indians dissolve a few particles of this in water, fill a leaf, folded conically, with the solution, and let it drop on their food as from a filter. Wallace speaks of the great desire that the Indians about the mouth of the Casiquiare had for salt. 'All wanted salt and I gave them a basinful each, and a few fish-hooks for carrying a heavy load eleven miles ; this is about their regular payment.'

The Paes of Popayan in South-West Colombia are almost as fair as Europeans. They carried on an active commerce, with salt and gold as their only medium of exchange and the most important articles of barter. This salt they obtained by boiling saline earth in jars. To-day, at Zipaquira,

galleries have been driven into the hill, and the supply of salt has been found inexhaustible. ' There are other mines at Nemecon, Sesquile, and other places in the same neighbourhood, and these salt beds continue into Buyacá and perhaps Santander. There are salt deposits of less productiveness in Antioquia and in many places in Cauca.' The coast districts of Colombia, too, supply large quantities of salt made by evaporation of sea or lagoon water, and yet, even to-day, the want of this substance is severely felt in parts by a people who make eager quest for it. It would seem probable that other peoples living in the midst of such plenty will be equally fair as the Pacs: Oviedo speaks of the ' Chibchas ' as ' fairer,' but I have seen no more exact description of their colour than this.

Trails lead to the Cerro de la Sel in Peru, ' some from the Amazon and from Argentina more than a thousand miles away, some from nearer points and from all local directions. The salt from this locality was so highly prized that it drew aboriginal populations about it in even pre-Incan days, and was a source of supply, as well as, it is affirmed, of abundant tribute to those dominant Pueblos of South America, the Incas of later days.' Lieut. Herndon,[1] travelling down the Huallaga, gave attention to the salt resources of the country through which he passed. ' We passed,' he says, ' the Quebrada or ravine of Huinaqua, on the right. A small stream comes down the ravine, the water of which is salt. The people of Uchiza ascend it a day's journey to a salt hill where they supply themselves with this indispensable article. At twenty minutes past eleven we passed another; and at one p.m. another where the people of Torache get their salt.' Below the mouth of the Huanza were the Hills of Pilluana, stretching along the banks of the river for a quarter of a mile and covered with salt that shone like frost on the red earth. Farther down the river he passed the salt hills of Callana Yacu, where the people of Chasuta and the Indians of the Ucayali and Maranon get their salt—the salt ' crops out ' on the banks of the river. A chief

[1] Herndon and Gibbon, *Exploration of the Valley of the Amazon*, vol. i. p. 145. Washington, 1853.

product of Laguna near the mouth of the Huallaga is salt fish. Every year about the month of August the Indians of the Maranon and Ucayali make a voyage up the Huallaga for their supply of salt. Near the port of Uchiza Herndon saw a river hog . . . 'he is also red, and I thought it remarkable that the aboriginals we had seen—the deer, the monkeys, and the hog—should be all of this colour.'

The Mayorunas are a hunting tribe wandering between the Maranon, Ucayali, and Yavari: Markham finds it necessary to state that they are not descended from Spaniards. The fair Remos are the vagabonds of the Ucayali, supporting themselves by hunting, fishing, and collecting sarsaparilla and salt fish for the traders. There are other tribes leading a similar life in the same neighbourhood of whose colour I have no sufficiently exact information. The Omaquas are fairer than other Indians, the Cocamas are yellow-brown, the Shipibos are only differentiated from the Remos by their greater stature.

A number of fair tribes live among the head-waters of the Madeira. They are huntsmen and fishermen, planting patches, however, with bananas, manioc, maize, and sugar-cane. Of their desire for salt and the means of gratifying it I have learnt the following. The Yurakares will not look for salt during the growth of their maize, lest the crop be destroyed. At Trinidad the cost of a brick of salt weighing 10–12 lb. is about 9*s.* 6*d.* The centre of the trade is some forty-five leagues from Cochabamba, to which place the salt is brought from the salines of Central and Western Bolivia. My authority goes on to state that the trade in this article is very important to the civilised Indians of the Beni, as their neighbourhood is entirely without salt deposits—yet *The Times* Atlas marks salines along this river; further, that 'the savages of the Madeira, such as the Caripunas and Pacaquaras, do not seem to have acquired a taste for the luxury, as, although they will eat salted provisions when given to them, they do not ask for salt or care to accept it.' Of the Mojos plains Keane writes thus in Standford's Geography: 'Here the divide between the Amazon and Plate basins is still so low that the waters of the head-streams are

intermingled during the rainy season, and after subsidence a number of shallow depressions either remain permanently flooded or else form saline morasses'; and the great Bolivian Chaco [1] is described as absolute plain, stony in parts, more often clayey, with here a wood, there pasture land, and there lagoons, sometimes saline, sometimes fresh—which frequently dry up when the rains have passed. There is evidence that the Indians living in these surroundings do desire salt as such, and whether they will or not they must take much salt into their systems with the fish and game which form the staple of their subsistence.

In the east another fair but very primitive tribe, the Botocudo, roam among the woods between the Rio Doce and Rio Pardo. They make no attempt at agriculture, but live by hunting and fishing, with such honey, fruits, and seeds as they chance upon. They take no salt or other seasoning; a native, who had been persuaded to take some, expressed disgust. Yet the bulk of their food must contain salt, and frequently, too, their drink. 'The basin of the São Francisco from the Rio Verde northward to the Rio Salitre is extensively covered by saline deposits, and some of the streams—as, for instance, the Rio Verde, a river navigable for some distance by canoes—are brackish.' And again: 'To the west, the mountains withdraw themselves still further from the stream. . . . Here one sees, especially in the low places and particularly after rain, white crusts of salt weather out, and the places where it makes its appearance most abundantly are the salt mines of the inhabitants. These mines lie sometimes at a great distance from the river.' 'Though the river bottoms or the overflow portions of the valleys afford the principal sources of native salt, the borders of the half-dried lagoons not infrequently abound with a similar efflorescence. Such salt licks occur as far south at least as Januaria, where they are numerous. . . . Most of the streams of Bahia are brackish, at least in the dry season.' [2]

[1] Martin and Macessy quoted by Chervin, in *Anthropologie Bolivienne*. Paris, 1908.

[2] *Sc. Results of a Journey in Brazil*, by Louis Agassiz, p. 328. Boston and London, 1870.

The Chonos Islanders and Alikhoolip of Western Tierra del Fuego are pale like the Spaniards. The Yaghans living on either side of the Beagle Channel are described as light copper in colour. The observers on the *Beagle*, however, saw numbers, of women particularly, who showed a decided rouge in their cheeks, and it has been maintained that their coppery tint is due, not to pigment in the *rete mucosum*, but to the blood showing through a very thick skin covered with dirt. The islands inhabited by these people are subject to a heavy rainfall and are thickly covered with trees: human life is almost entirely confined to the shores, where fish and shell-fish, seals, and an occasional stranded whale give it rather precarious support. If the natives are hurried, they eat their victuals raw, otherwise they roast the shell-fish and half roast any other fish. They eat and drink very frequently, two or three times in the course of the night. They must consume, therefore, each day an amount of salt which, relatively speaking, is considerable.

The greater part of the mainland of Tierra del Fuego is pampas, the natural environment of the guanaco and tuco-tuco, the food of the savage and wandering Onas. While the men are occupied in the chase, the women, if the coast be near, catch fish and collect shell-fish, and hence there comes considerable increase in the saline content of their food. Their colour is spoken of thus: 'Remarkably fair for one who lives all but naked in the open air.' 'Fairly light.' 'Slightly reddish, white even at times; their colour resembles that of Europeans burnt by the sun.' While they are darker than their neighbours of the western islands, they are fairer than the Patagonians, who, living in a country very similar, never make use of the saline products of the sea-coast.

The South American tribes—other than the Onas—who in respect of colour have an intermediate position between the comparatively fair and comparatively dark, are all agricultural, depending, too, in greater or less degree, on fish and game. In the east there are the Guayanas, the Guaranys, and the Tupis, occupying the wooded land between the Uruguay

and Parana, and the coastal strip northwards and westwards to the mouth of the Amazon. I do not know of their appetite for salt, but Darwin when travelling from Bahia Blanca to Buenos Ayres met a party of mounted Indians going to a saline for salt, and he says : ' The Indians eat much salt, their children sucking it like sugar.' The Guayanas and Guaranys had supplies, however, nearer than the saline streams and salt deposits south of the Plata, at Concepcion on the Uruguay. The eastern Guaranys were more favourably situated still. The lagoon of Araraumа was so rich a store that its exploitation was prohibited by royal letters in 1690. There are natural salines in Minas Geraes—of Bahia I have already spoken—in Rio Grande do Norte, in Ceara, in Para. And yet salt as such is relatively scarce. There is some small commerce on the river Doce. To travel 200 miles in the canoes employed takes twenty days. On the coast 60 lb. of the commodity costs a dollar, in Minas Geraes four dollars or more.

Rock salt is found in Matto Grosso ; to-day, however, long caravans set out from Concepcion with supplies for the monthly feed of salt without which both the health and fecundity of the cattle are impaired. The Bakairis, at the source of the river Xingu, make use of a saline earth. Moreover, they prepare a salt by incinerating certain water plants and lixiviating the ashes ; this is consumed as a great delicacy. The neighbouring Bororo are a hunting people with no agriculture. Yet vegetable food, which they obtain in exchange for arrows, plays an important part in their sustenance. Salt is despised ; but perhaps the clay with which they shake up their drinking water during the wet season is impregnated, as often happens in Brazil, with salt.

Concerning the Chiriguanos, Chiquitos, and other of the comparatively fair tribes about the sources of the Madeira and Paraguay there is little to add to what has been said already. They depend principally on agriculture, and the sources of salt open to the Yurakares, their neighbours, and others of the fairest tribes are open to them, though in less degree. And thus too it is with the yellowish brown Jivaros,

Zaparos, and Ticunas in comparison with their fair neighbours the Mayorunas. Salt is said to be very scarce among the Jivaros ; they have, however, a ' saltpetre '—probably saline—earth or clay which they eat. The Zaparos do not eat salt, but they, like the Jivaros, depend on fish in some measure for their subsistence. A Ticunas Indian will devour twenty-four small turtle three or four times a day.

The darkest skins are possessed by the flesh-eating peoples of the Patagonian pampas and Paraguayan Chaco, by those dwelling among the swamps near the sources of the Paraguay River, by the agricultural Quichua and Araucanians, and by the peoples of Guiana and Venezuela. I might add, too, the Gauchos or ' countrymen,' people of mixed Spanish and Indian blood who roam over the pampas tending their cattle or leading the life of freebooters. They are scarcely a shade lighter than the Indians, and, like the Indians in whose environment they live, their food consists almost entirely of beef, of armadillos, ostriches, game, and eggs. They scarcely eat any salt, though there is plenty around them. Nor do the Charruas. The Gauchos and Charruas roast their meat, the Tehuelches and Pehuenches boil it, which probably accounts for their appreciation of salt, as this ingredient is withdrawn from flesh by the hot water. All these tribes, with the Pampas Indians and Puelches, take care not to lose the blood of the animals they kill. Darwin describes a meal: ' Some drank till they were intoxicated ; others swallowed the steaming blood of the cattle slaughtered for their suppers, and then, being sick from drunkenness, cast it up again and were besmeared with filth and gore.'

The tribes of the Paraguayan Chaco were huntsmen and fishermen, but they depended also in some measure on wild beans, wild honey, tops of palm trees, etc. Fish they roasted, flesh they generally boiled. Chervin says the Mataco boiled their fish and birds in earthen pots without salt. Indeed, he says, salt is entirely wanting in the Chaco on the banks of the Pilcomayo. The Abipones, who lived between the Salado and Parana, were very fond of salt ; to

get it they had recourse to the incineration of plants. It is interesting to find that many of them were fairer than many Spaniards.

The Guato live among the lagoons and rivers which flow into the Paraguay towards its sources. They have much game and fish, and in addition the banana and other wild fruits. Max Schmidt, in speaking of the Guato's custom of boiling their fish and flesh in water rather than roasting it, gives it as a specific difference between the customs of South Americans generally and those of other rude peoples. The broth is regarded by the Guato as a great delicacy. Salt or any other condiment is wanting in their diet.

Of the Guiana tribes in general im Thurn says they are of a very old cinnamon colour. There are considerable differences in shade in various tribes, those of the forest being fairer than those of the savannah. After two years' clothing the skin is quite remarkable for its fairness; yet, when exposed for two months, again becomes quite dark. The Warraus, he says, are apparently very dark, but this is really due to dirt. The difficulties of estimating skin colour is apparent. These people depend for their livelihood in equal degree on game and fish, and on agriculture. It is seldom that one enters an Indian house without seeing some or all of the women engaged in making cassava bread. The Indians are extremely fond of salt: to-day they obtain much from the English and Brazilians, and take it often as an English child takes sugar. At their meals, which they take when and as often as they feel inclined, the bread—which is made without salt—is dipped into the thick soup of flesh, fish, cassareep, salt, and peppers called 'pepper pot.' The Caribs are darker than other Guiana tribes: they make no use of salt, though it is procurable. The Macusi are even darker than the Caribs according to im Thurn; the Ottomacs were the darkest of the peoples with whom Humboldt came in contact. These tribes are far removed from any salt supply.

A glance at any large map of South America will show that the country of the Quichua and Atacama is well provided with salt; will show, too, that communication of one

district with another must be a matter of some difficulty. Speaking of the Quichua of the high lands of South Bolivia, Chervin says that blocks of salt are carried on the backs of llamas from the pampas of Uyuni to supply the Indians of the interior where this substance is not found. The Quichua are that composite of nations that resulted from the long-sustained civilising and assimilating régime of the Incas; they are essentially agricultural. Great roads led from Cuzco, the capital of the Incas, to the farthest corners of their dominions. To and fro along these roads were carried the necessaries and luxuries of life. It is improbable that the paternal care of the Incas allowed any in their dominions to suffer from shortage or live in unnecessary abundance.

The Araucanians, to the west of Patagonia, are the fairest of the tribes with which we are now dealing. The Aymara, on the shores of Lake Titicaca, are a shade lighter than the Quichua and Atacama. The Araucanians eat little flesh; maize and sweet potatoes are their staple. They obtain salt by evaporating sea water and from deposits in their mountains. The food of the Aymara is much more vegetable than animal in character: their chief dish is a soup made of potatoes and any flesh they may have, with salt as a seasoning. The potato is the staple of the Quichua likewise: flesh is only rarely eaten.

X

Africa

In the extreme north and extreme south of this continent there are peoples of exceptional fairness—in some cases to be compared only with the fairness of the peoples in mid-Europe; in the west, centre, and east there are peoples who are among the darkest of mankind. Contrasting the environments of these fair and dark peoples, it appears that, while the first inhabit countries exceptionally rich in common salt, the last are confined to a soil almost

wholly destitute of this substance. In the north of Tunis one-tenth of the natives at least are blond; the Riffs of Morocco are two-thirds of them blond, the remainder brown like the people of South-West France; the Moors are quite fair—more than one-third are blond—but they are darker than the Arabs of Algeria; the Berbers, many of them, are scarcely darker than the average South European, and some, and in the north-west most, have grey or blue eyes and fair hair; the Akka, south-east of the Wady Draa, are no darker than an ordinary Spaniard.

In Algeria and Morocco salt abounds: so plentiful, indeed, is this substance that the enormous natural salines in the east are used only by the Arabs encamped on their edges. The salt mines to the west of Ain Temushent, the mines of the Jebel Sahara, and the deposits from the lake Arzeu have been exploited from very early times, the latter furnishing annually 3,000 tons of salt.

The Tuaregs, who control the western traffic in the salt from the pans of Bilma, an oasis to the north of Lake Chad, are scarcely darker than the average South European, and some of them have blue eyes. 'Bilma is regularly visited by traders, who there exchange wheat, cloth, and slaves for the salt, which they distribute throughout Sudan with caravans of many hundreds, and even thousands, of camels. . . . A camel load which at Bilma is bartered for about 4*s*. worth of corn often fetches from £6 to £8 in Sudan. . . . As many as 70,000 camels are said to be constantly engaged in this traffic.' Taudeni, to the west of Bilma, is another centre of salt culture, and from the mines of Sebkha Ijil, farther west still, many thousand camel loads of salt are yearly conveyed northwards to Tafilet in South Morocco.

The basis of the food of the sedentary peoples of Morocco and Algeria is farinaceous—a porridge of wheat, barley, or millet—with dates, honey, and milk. The wandering Tuaregs and the Akka dwarfs depend more on the produce of their flocks. A handful of powdered and salted meat will suffice an Akka for two days.

Central and Western South Africa, except for a strip on

the southern coast, is extremely dry. For a thousand miles—between the Orange and Cunene Rivers—not one perennial stream reaches the sea, and one must travel four hundred miles south of the Orange to reach the Olifant's River. Over the whole of this region the yearly rainfall is probably not more than three inches. The rain, when it does come, collects in pools; the water evaporates and there remain deposits of salts. The Sechuana word 'kalahari' means salt pans. Robert Moffat asked an individual who had spent many years in Great Namaqualand what was the nature of the country. 'Sir,' was the reply, 'you will find plenty of sand and stones, a thinly scattered population, always suffering from want of water, on plains and hills roasted like a burnt leaf, under the scorching rays of a cloudless sun.' 'Fountains,' says Moffat, 'are indeed few and far between, the best very inconsiderable, frequently very salt, and some of them hot springs; while the soil contiguous is generally so impregnated with saltpetre as to crackle under the feet like hoar frost.' The missionaries who first travelled from Cape Town to evangelise the Bushmen felt they must rejoice when able to get just a drink of water, which was mostly salt and brackish. Near Pella, Moffat's companions 'laboured a long time, digging an immense hole in the sand whence they obtained a scanty supply of water, exactly resembling the bilge water of a ship, which was drunk with an avidity that no pen can describe.' Such was the environment that made these famished countries the safe retreat of Hottentot, Bushmen, Korana, and Namaqua from the reprisals of their powerful neighbours. In these wastes they wandered in search of water and game, or driving cattle, filched from kraal or farm. The Bushmen are the lowest, the most scattered, the most nomadic, and the fairest of these fair peoples—often a tinge of red is perceptible in their cheeks. Their different hordes, separated only by a hill or river, yet speak different languages. All have this one thing in common, a fair complexion. Whether they will or not these wanderers must consume much salt—their water is brackish, the animals and chance roots and green stuff that feed them are

all the products of a saline soil. It is significant that the Botocudo tribe of South America, living in the saline district of the São Francisco River, refuse salt; that the Ova-Herero [1] tribe of Damaraland likewise refuse salt; that Moffat, after living in South Namaqualand, could write thus: 'I had neither bread nor vegetables. Mr. Bartlett, of Pella, once sent me a bag containing a few pounds of salt, but on examining it, I could scarcely tell whether there was most sand or salt, and having become accustomed to do without it, I hung it upon a nail, where it remained untouched. My food was meat and milk, living for weeks together on one, and then for a while on the other, and again on both together.'

Passing now to the darkest peoples of Africa: that which is set down on pp. 38 and 39 respectively regarding the customary fare of the Mandingoes in the west and of the Dinka of the Southern Nile, holds good for the peoples of the Western Sudan generally and of the Lower Nile. Living as they do very largely on a farinaceous and vegetable diet, their desire for salt is acute; and their countries are totally devoid of it. 'The long use of vegetable food creates so painful a longing for salt that no words can sufficiently describe it.' The poorer people of the Western Sudan seldom taste this precious substance: throughout the entire country between the Senegal and the Niger, Gallieni was struck by the almost complete lack of salt in the people's food. In the army of Samory, the chiefs alone had a little salt; this was one of their most precious perquisites. It was only at certain festivals, says Lefebvre, that the Mandingoes and Bambaras made use of it. At Accra on the Gold Coast one, or even two, slaves was the willing price of a handful. De Crozals gives the following prices: At Temuku 1 kilogram (2·24 lb.) cost fr. 3·36; at Tiongi fr. 5·50; at Niélé fr. 8·50; and it has been already stated that salt which at Bilma costs 4*s.* fetches £6 to £8 in the Sudan.

[1] The inland people who live by cattle-raising and agriculture are rich brown in colour; their land is subject to a periodical though very uncertain rainfall. The coast peoples are darker: dense sea fogs rise over the coastal strip at dawn.

'Truly,' says Frobenius of the natives of the Egyptian Sudan, 'they are accustomed to a somewhat tasteless diet, for common salt is wanting throughout the whole of Central Africa, and they content themselves with the salts washed from the ashes of wood.'[1] In none of the countries that Schweinfurth visited in Central Africa was either sea salt or common salt an article even of commerce; but he did learn from the Khartoomers that Munza, King of the Monbuttu, received tribute from the Akka—dwarfs of the central forests—in the shape of 'real good salt' which was brought from the south. The urine of oxen took the place of this substance in some measure, and among the Shilluk as among the Dinka there was no milk vessel devoid of the penetrating and unpleasant smell of this substitute. The chief of the Latukas would eat a handful of salt greedily. Yet the Bari, who alone of these marsh negroes make a practice of obtaining this substance—since at Rejaf the clay is slightly saline—are his near neighbours; this preparation is on a very small scale, the solution of salt being concentrated in small earthen pots. In the same way the people of Dar Fur wash a clay found in the neighbourhood of the Wadi Burka, and evaporate the solution so obtained. The price is one slave for 12 lb. De Crozals quotes Mohammed el Tunsy, saying that all the salt that Dar Fur has comes from Bir el Malha: it is the worst in the world. In Sennaar and Kordofan some salt is obtained by the lixiviation of earth found near Araschkool, some distance from the left bank of the Bahr el Abiad: it is very precious, and costs 5 piastres a basket.

I have not ventured to separate the tribes of Africa into more than five groups on the basis of colour. From the evidence of the previous pages it is clear that while the fair tribes of the north and the rather less fair tribes of

[1] The ashes of wood are lixiviated also in the W. Sudan to provide a substitute for salt. The following is an analysis of one specimen, quoted by de Crozals from Dybowski's *La Route du Tchad:* potassium chloride, 67·98 per cent.; sulphate of potash, 28·73; carbonate of potash, 1·17; insoluble matter, 1·65. Here is no common salt—sodium chloride—though doubtless the mixture had excellent tonic effects.

the south are in an exceptionally favourable position as regards salt supply, the black tribes of the Sudan are in an equally exceptionally bad position. It remains to be shown that the deepening in skin colour of the two remaining groups is associated with increasing difficulties in obtaining salt. The fairer group—yellowish brown to copper—includes the Fulahs, Susis, Ansarii, the Bedouins of Cyrenaica and Libya, the Copts, Bogos, Abyssinians, and perhaps the Hassanieh, Gallas, and Somali. These tribes, with the exception of the last three, have as their staple food dates and grain with milk, and an occasional feast of flesh. The Fulahs and Susis are at no great distance, comparatively speaking, from the rich salt supplies of Sebkha Ijil. Salt is one of the chief products of Fezzan. To the north of Murzul there is a group of lakes whose waters are charged with chloride and carbonate of soda. In Tripoli a series of saline lakes extend from the Wady Fareg through the oasis of Siwah to Sittra. And in the Kufrah Oasis in the Libyan Desert there are saline ponds and marshes. Among the Egyptians, from the earliest times, salt has been the emblem of hospitality. The Birkel el Kerun is a salt lake, and there is a chain of salt lakes which now form part of the Suez Canal. In Abyssinia, salt is a medium of exchange. It may be partly for this reason that the Abyssinian says of a millionaire, 'He eateth salt.' Yet there are many sources whence come their salt supplies. From the mines of Shendi in the west, from the salt plains of Tigre in the north, from Lake Assal and other salines in the east, it is brought to Abyssinia, most of it to Sokota, the chief market. The value varies from place to place, as the difficult nature of the country would lead us to expect: one pound for twopence or thereabouts is its average rate of exchange. At Massowah on the coast its value is much the same.

The Hassanieh and other Arab tribes of Nubia are described as of the colour of deep copper; the Somali variously as of the colour of the Arabs to black, as light, as very dark, as the reddest of men; the Gallas as very dark brown with some of their women remarkably fair, as coppery.

The wealth of the Arab tribes consists in their flocks of cattle, sheep, and goats. The Gallas and Somali formerly lived mostly on their flocks, though now a flesh-meal is to them a luxury, maize or rice with milk constituting their staples. The Hassanieh use salt, and the mines of Shendi are within reach, likewise the supplies that furnish Abyssinia; the animal diet on which they subsist will give them, moreover, much of the salt they require. The Somali, too, appreciate salt, and supplies come to their country from Shendi: the great quantities of milk drunk by them and the Gallas will make their intake of salt comparable with that of the Hassanieh. The reader will have in mind perhaps the effect of the intake of liquid on the elimination of salt.

The Monbuttu, Bongo, Mittu, Nyam Nyam, Yakomas, and the dwarf tribe of Akka are reddish brown in colour: like their northern neighbours they inhabit a land almost devoid of salt, but unlike them they have a diet which is largely animal. As stated above, Schweinfurth learnt from the Khartoomers that Munza, King of the Monbuttu, received tribute from the Akka in the shape of real good salt which was brought from the far south. Casati says, however, that the Akka themselves use no salt. Smoked fish, buffalo flesh, antelopes, gazelles, and chimpanzees are the daily food of the Monbuttu; manioc, sweet potatoes, or bananas are their substitutes for bread. The Bongo depend more upon corn (sorghum), but at the end of the rainy season devote themselves to fishing and hunting for their means of subsistence. The children's daily amusement is to catch and eat field mice. The Mittu, Nyam Nyam, and Yakomas, like the Monbuttu, are cannibals. In the Bongo language the verb 'to eat' means corn, in the Nyam Nyam language flesh. When not at war the latter are hunters, and in certain places and at certain seasons game is very abundant; they do, however, use much grain (eleusine corocana) and cassava. The Yakomas of the High Ubangi are riverains, and live on the produce of the river and neighbouring woods. They, too, have sorghum, maize, and a little manioc. Like the Bongo, they season their food with

salts obtained by the lixiviation of wood ashes. The Akka are hunters, and such vegetable food as they have—they are exceedingly fond of bananas—is obtained by theft or in exchange for game.

The Wanyoro, Waganda, and Waheia, and the tribes mentioned later, are all of a colour varying from copper to dark brown; the first three are careful and industrious agriculturists. The plantain is the staple of their existence. If, owing to drought, the plantain fails, the country starves. They scarcely ever eat flesh, but milk is drunk generally. The Waheia, as well as the Waganda, import salt mostly from Katwe, on the Albert Edward Lake. This, though strongly impregnated with sulphate and carbonate of soda, is a delicacy. It was to protect this salt trade that Lugard founded Fort George. Vacovia and Kibero, on the Albert Nyanza, are likewise centres of salt industry. A Waganda chief on marrying gives the father of the girl two cows, two bundles of bark cloth, two goats, and two bundles of salt. Tobacco is chewed by the Wanyoro, men and women, young and old, salt being mixed with the leaves. The Nandi tribe, to the north of the Victoria Nyanza, of whose colour I have no precise information, but which I believe to be similar to that of the Waganda, do not themselves eat salt, but they drive their cattle to salt lakes once a fortnight, and usually dissolve some salt in the water given to the calves. Moreover, they bleed their animals habitually, pressing an arrow head into the superficial veins of the neck, and drink the blood by itself or mixed with milk.

North of Kilimanjaro lies the Dogilani desert, a 'boundless saline steppe.' Over this the semi-nomad Masai tribe roam with their flocks of cattle and goats. They are fewer than they were formerly and are becoming, many of them, settled agriculturists. Till they reach twenty-five, their diet consists of milk and flesh alone; after marriage they eat vegetable food also, bananas, sorghum, etc. Like the Nandi, they frequently draw blood for food from the living animal; like the Dinka, they wash out their milk vessels daily with urine. I do not read of their using salt as such in their food. One of their tribes, the Wandorobo, live

on what their hunting brings them. If their luck is bad—which seldom happens—they live on honey, wild fruits, and roots ; if good, they exchange flesh and steppe salt with the neighbouring agricultural tribes. Of these the Dschaggas, the Akikuyu, and Akamba prize cattle for their milk and dung. Flesh they seldom eat. Here is the typical daily diet of the Dschaggas—the poorer people will only have two meals a day—1st meal : beans and bananas with addition of bad salt ; 2nd and 3rd meals : a mess of cut up unripe boiled bananas and sour milk (without the addition of salt), of potatoes and milk, or merely of potatoes, beans, or bananas, roasted in the ashes. The salt from the steppes about Kilimanjaro contains much carbonate of soda and magnesia, and varies considerably in its quality ; the best is eaten, the worst is mixed with their snuff. The Akikuyu and Akamba depend chiefly on grain—maize, millet, or sorghum. Much of their salt comes from the pans of Uvinza ; this is very good, and always finds a ready sale.

' Farinaceous food is the mainstay of the Central African negro and is chiefly eaten in the form of porridge. This is ordinarily made of the flour of sorghum, maize, cassava, or banana ; nearly always of sorghum, however . . . and is eaten usually with a relish, fish, fowl, meat of any kind, spinach made from various leaves or flowers, white ants, etc.' The better-off among the Marotse obtain two-fifths of their food from agriculture, one-fifth from cattle, more than one-fifth from game, less than one-fifth from fish—the poorer suffer from a wide pervading want of necessaries. ' Salt is much liked. It is an absolute necessity of existence in the negro's opinion. It is put into porridge, and above all into the relish eaten with the porridge or rice.' It is obtained from the brackish Mweru marsh, from Lake Chilwa and the country west of the Shire. Lake Rukwa, in the north, is so brackish that it is quite undrinkable ; to the west of the Matabele there are the Great Makarikari and Ntwe Ntwe salt pans. Moreover, the natives burn grasses and plants and obtain a salt by lixiviating the ash.

The Kaffir tribes in the south-east and the Ova-herero in the west of South Africa are essentially pastoral ; their

principal food is a mash of cooked and beaten corn (*Sorghum caffrum*) eaten with milk curds. Only the chiefs and their suite are in a position to make a regular addition of flesh to this diet. I do not read of any generally pervading demand for salt. An old woman begged piteously of Kidd to give her a little. Livingstone when travelling in this country wrote: 'Meat counteracted the bad effects of an exclusively vegetable diet. When the poor, who had no salt, were forced to live entirely on roots they were often troubled with indigestion. We cured the disease by giving them a teaspoonful of salt. Either milk or meat had the same effect, though not so rapidly as salt. Deprived of salt for four months, I felt no desire for that condiment, but was plagued by a very great longing for the above articles of food. Milk or meat, in however small quantities, removed the excessive longing.'

The Fiote, at the mouth of the Congo, regard manioc as their staple. Of flesh they consume little. On the other hand, they consume considerable quantities of fish, prawns, oysters, etc., and have the practice of extracting salt from sea water. Manioc is likewise the staple of the Ba-Yansi tribe of the Upper Congo. These, however, have abundance of fish and small game—in sufficient quantities, indeed, to smoke and export, both fish and meat. 'Salt is to them an indescribable delicacy.' One man wished to exchange his wife for a moderate quantity of salt; another was given a few pinches, and immediately implored Johnston, the giver, to become his blood brother. They considered he must be a great chief to possess two whole bottles of salt. The staple of the Fans is the banana; they do not drink milk, but all eat some flesh once a day, and many twice. They eat fish, too, and the bodies of their slain enemies. They have a special word to signify the craving that comes after short abstinence from animal food. They will suck salt as children do lollipops.

Lake Chad is quite fresh. The herbage round, says Barth, is so destitute of salt that the milk of cows and sheep fed on it is rather insipid and somewhat unwholesome. And the countries to the east and south of Chad, Bagirmi

and Adamawa, are likewise almost entirely without salt. On the other hand, one direct trade route from the mines at Bilma passed through Kuka, and 20,000 loads of salt passed annually through the market of Kano ; but I have already spoken of the enormous increase in cost between buying at Bilma and selling in Sudan. About the shores of Lake Chad the price of salt is sixteen times its price in Tibbu—only 25 lb. of it can be obtained for a Spanish dollar. Nevertheless, a small quantity of salt finds its way to the market of Adamawa. The need for salt is met in some measure by a preparation from the ashes of plants or of dung. Sama and Miltu, on the lower Shari, are both famous for their manufacture of this substance; also Ngigmi, on the north shore of the Chad. It is a weak and insipid preparation—but better than that obtained in Kotoko from neat's dung—and it is a valuable article of commerce. Denham says that no other land in the tropical zone is so poor in fruits and vegetables as Bornu : the people live mostly on fish, milk, and rice.

The staple of Benin is the yam ; with this the rich eat beef or mutton, the poor fish. This fish all comes from the estuary, and is dried and smoked. The Sobos and Fantis have much the same diet, with cassava in addition. The Lobi further inland have millet and maize with yams and other vegetables, also fish and flesh ; an animal diet is preferred. They obtain their salt from burnt excrement. The most profitable goods in the trade of Benin are dried fish and salt. This salt is obtained from the ashes of a salt bush which grows near salt water. There is great competition among the Benin river chiefs for this land, as its possession means a valuable monopoly. Salt is made, moreover, by the evaporation of sea water, and on the coast is used as a medium of exchange, ten pounds being worth from two to three shillings. An offensively bitter salt is also obtained from the ashes of the mangrove and is much sought after.

There are millions of black people, it may be urged, in the United States of America who, notwithstanding a change of environment during hundreds of years, yet retain the colour

of their West African forefathers, though salt is procurable by all in what quantity they will. I make no suggestion as to the period that must elapse before the intake of increased quantities of salt will cause a lightening of skin colour: I do not know how far the States negro avails himself of the salt at his command—I have sought statistics without success—but I read in *The Times*[1] of a perceptible diminution in the pigmentation of the present-day Black, and transcribe the following from Thomas' 'American Negro': 'There are already hundreds of thousands of white negroes in America. A native pure-blooded negro is rarely found, though we have some millions of black people in whom a greater or less infusion of white blood exists. Colour moreover is not an infallible criterion of race identity; some very fair freedmen have more prominent negroid characteristics than others who are very black': and again, 'Even now many persons of negroid ancestry are so fair in colour that they readily pass for white people, and marry among that class without exciting the slightest suspicion as to their mixed race identity.'

XI

Where salt or salt-containing food is a luxury, the upper or wealthier classes will be fairer than the lower or poorer classes. Such, in the first section of this essay, was stated to be a necessary consequence of salt being a correlative of skin colouration. In twenty-one cases I have found comparisons drawn between the skin colour of the upper and lower classes. In twenty of these cases the higher class has the fairer skin, in one case only, that of the Bechuana, is it otherwise.

Hindus . .	The colour is deeper in the inferior than in the higher castes. The women and children of Rajputana are whiter than the Italians of the South.
Tamils . .	The colour is deeper in the lower than in the superior castes.

[1] January 25th, 1909.

Laos	Sometimes the colour in the upper classes is almost white.
Annamites	Those of high caste are waxen white.
Cingalese	The higher classes are fairer than English brunettes.
Kafiristan	In the inferior classes and among slaves the colour is much darker.
Maldive Islands	Some high-caste ladies are fairer than many women of South Italy.
Tibet	The upper classes are as white as Europeans ; the common complexion is tawny.
Savu	The upper classes are almost European white; the common people are black-brown.
Sumatra	Yellow, more or less dark. Some of the higher classes, especially the women, approach whiteness.
Caroline Islands	The nobles are clear yellow ; the people are brownish.
Tonga	At times those of the upper classes are fairer.
Samoa	The chiefs are whiter.
New Zealand	It is mostly the chiefs who are light.
Araucanians	The chiefs are of a white colour.
Benin	A chief whose colour approached that of an American Indian ; wives and daughters of freedmen are olive.
Fantis	Women of better family are light.
Fulah	The inferior classes are the darkest.
Egyptian Arabs	The labouring classes are much darker.
Cyrenaican Bedouins	Women of the higher classes are fair.
Bechuana	The chiefs are the darkest.

The colour difference of higher and lower classes—frequently, that is, of leisured and working classes—may in some cases come from greater exposure to the sun through the exigencies of labour. But this effect of exposure is well known, and I do not think that observers would make statements concerning the fairer colour of one class without some qualification in respect of environment, when such was necessary to prevent misconception. Nor will marital selection account for the difference. I know of no evidence that there is a constant preference among human beings for their fellows of fairer complexion. It may be that the capacity to acquire power and govern and relative fairness of skin are co-ordinable ; but if this is so, the cause of the one

will be found ultimately to be the cause of the other. The environmental difference between those who have power and those who have not is that the former can procure the luxuries of life, the latter only the bare necessities. And in all the cases cited above one great luxury is salt, consumed as a condiment or in association with flesh or fish.

XII

Freckles may appear on the skin of youth after exposure to the hot sun of a single day ; in time they will pass away : the large and increasing freckles which in some cases mark the hands and faces of the aged are permanent. The darkening effect of the sun's rays is even more marked in the cases of coloured than of white men. Perhaps it is that while a hot sun is required to affect the rapidly flowing blood of youth, normal daylight can precipitate pigment from the slower moving blood of age : perhaps too the readier absorption of light by darker skins allows the tanning to proceed faster with coloured than with white men. Infants of dark races are comparatively fair for the first few days of their existence ; and the youth are fairer than their parents.

Recently I spent 2*d.* at a London bookstall on 'An Essay on the Causes of the Variety of Complexion and Figure in the Human Species,' written by the Rev. Samuel Stanhope Smith, D.D., Professor of Moral Philosophy in the College of New Jersey, and published in 1789. This essay summarises much of the information on skin colour available to the author, and is marked by careful writing and shrewd suggestion. The following are the propositions to which Stanhope Smith was led :

'1. It is a fact that the sun darkens the skin although there be no uncommon redundancy of the bile.

'2. It is also a fact that redundancy of bile darkens the skin although there be no uncommon exposure to the sun.

'3. It is a fact equally certain that where both causes co-operate, the effect is much greater and the colour much deeper.

'4. It is discovered by anatomists that the skin consists of three lamellæ, or folds—the external, which in all nations is an extremely fine and transparent integument; the interior, which is also white, and an intermediate, which is a cellular membrane filled with a mucous substance.

'5. This substance, whatever it be, is altered in its appearance and colour with every change of the constitution—as appears in blushing, in fevers, or in consequence of exercise. A lax nerve, that does not propel the blood with vigour, leaves it pale and sallow—it is instantly affected with the smallest surcharge of bile, and stained of a yellow colour.

'6. The change of climate produces a proportionable alteration in the internal state and structure of the body, and in the quantity of the secretions. In southern climates particularly the bile, as has been remarked, is always augmented.

'7. Bile, exposed to the sun and air in a stagnant, or nearly in a stagnant state, tends in its colour towards black.

'8. The secretions, as they approach the extremities, become more languid in their motion, till at length they come almost to a fixed state in the skin.

'9. The aqueous parts escaping easily by perspiration through the pores of the skin, those that are more dense and incrassated remain in a mucous or glutinous state in that cellular membrane between the interior skin and the scarf, and receive there, during a long time, the impressions of external and discolouring causes.

'10. The bile is peculiarly liable to become mucous and incrassated; and in this state, being unfit for perspiration, and attaching itself strongly to that spongy tissue of nerves, it is there detained for a length of time till it receives the repeated action of the sun and atmosphere.

'11. From all the preceding principles taken together it appears that the complexion in any climate will be changed towards black, in proportion to the degree of heat in the atmosphere, and to the quantity of bile in the skin.

'12. The vapours of stagnant waters with which uncultivated regions abound; all great fatigues and hardships;

poverty and nastiness: tend, as well as heat, to augment the bile. Hence, no less than from their nakedness, savages will always be discoloured, even in cold climates. For though cold, when assisted by succulent nourishment and by the comfortable lodging and clothing furnished in civilised society, propels the blood with force to the extremities and clears the complexion, yet when hardships and bad living relax the system, and when poor and shivering savages, under the arctic cold, do not possess those conveniences that, by opening the pores and cherishing the body, assist the motion of the blood to the surface, the florid and sanguine principle is repelled, and the complexion is left to be formed by the dark coloured bile; which, in that state, becomes the more dark because the obstruction of the pores preserves it longer in a fixed state in the skin. Hence, perhaps, the deep Lapponian complexion, which had been esteemed a phenomenon so difficult to be explained.

'13. Cold when it is not extreme is followed by a contrary effect. It corrects the bile, it braces the constitution, it propels the blood to the surface of the body with vigour, and renders the complexion clear and florid.'

Very little is known about the chemical composition of the colouring matter of the skin or of the hair: Sheridan Lea, in 'The Chemical Basis of the Animal Body,' leaves the matter severely alone, though he deals exhaustively with the pigment of the blood and the bile. But this is known, that Hæmatoidin,[1] the colouring matter of bruised flesh, formed by the metamorphosis of transfused blood, and Bilirubin, the colouring matter in the fresh bile of man and carnivora, are one and the same substance. Pure Bilirubin is a blackish amorphous powder; the first product of its oxidation is Biliverdin, which colours the bile of herbivora. Biliverdin on further oxidation is converted into the blue Bilicyanin, which again is converted by oxidation into Choletedin, a substance which in solution is yellow, in the pure state a brown powder. One is reminded of the succession of colours associated with a bruise.

[1] Formula, $C_{16}H_{18}N_2O_3$.

1. In the foregoing sections the circumstances and material of feeding, as they affect the intake of common salt into the body, have been fully reviewed. In almost every case it has been found that the amount of pigment in the skin, hair, or both together, of men living in their customary environment, varies with the amount of salt they directly or indirectly consume and retain in their systems.

2. (a) By injection of salt solution into the blood stream, the velocity of the latter is very considerably accelerated.

(b) Viscosity of blood, and so its rate of flow through the capillaries, is lessened by rise of temperature. The temperature of children up to 14 years is 37·21° C., that of old people (between 80 and 90 years) is 36·15° C.

(c) The shortest times in seconds taken by blood in circulating through the body are as follows: Newborn babe, 12·1; at 3 years, 15; at 14 years, 18·6; full grown, 22·1.

3. Hæmatoidin formed by the action of light and heat on the blood corpuscles is identical with Bilirubin, the colouring matter of bile.

4. The velocity of the red corpuscles in the capillaries is 0·5–1 mm. per second; anything that delays their motion will aid the effect of light and heat upon them.

It would appear then that pigmentation may be due to a change of colouring matter of the blood into Hæmatoidin or derived colouring matter by the prolonged action of light or heat, and that the effect of an increased intake of salt on pigmentation may be due to a lessened action of light, owing to an accelerated movement of the blood corpuscles.

DIET AND CRANIAL FORM

DIET AND CRANIAL FORM

The cephalic index, the ratio of the greatest length of the head or cranium to the greatest breadth—the values differ by some two units—is regarded by many as a racial characteristic. The manner of its measurement will be gathered from Figures 1 and 2.[1]

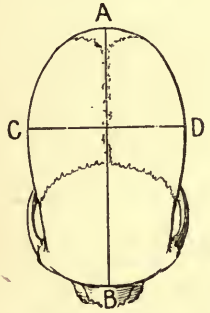
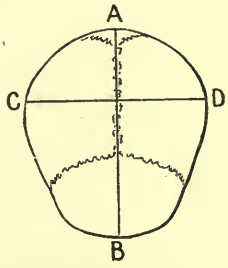
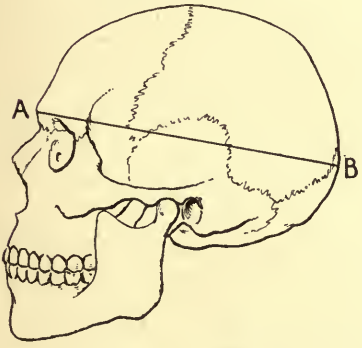


Fig. 1.—Islander of Torres Strait
(after O. Thomas)
Ceph. Ind. 61·9



A Ladin of Pufels (Tyrol)
(after Holl)
Ceph. Ind. 95



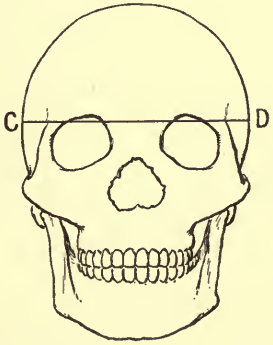


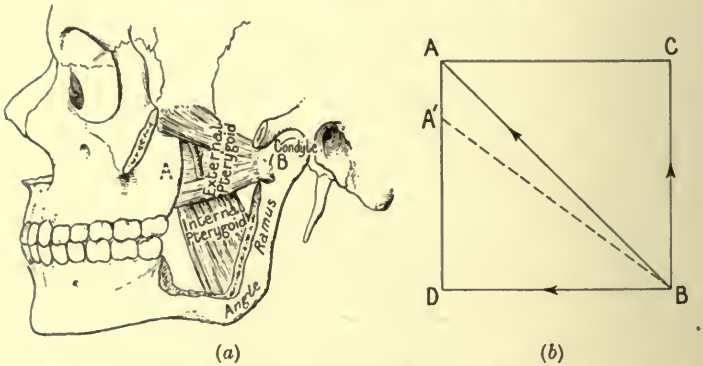
Fig. 2.—Ancient Egyptian

$$\text{Cephalic Index } \frac{AB}{CD}$$

[1] These figures are copied from *The Races of Man*, by Deniker.

The purpose of the jaws with respect to food is to hold, to bite, and to triturate. The muscles which serve them for these purposes are regarded here merely from the mechanical point of view.

External Pterygoid Muscle



(*a*) (*b*)

Fig. 3.—(*a*) After Gray. (*b*) Resolution of force exerted in the horizontal plane by ext. pterygoid

A is the mean position of attachment of the external pterygoid muscle to the external pterygoid plate: this muscle is almost horizontal.

B is the mean position of attachment of the same muscle to the condyle of the lower jaw. It is this muscle which, with others, pulls the jaw forwards and sideways.

Placed as these two points A and B are in the above diagram (in accordance with Fig. 70 of Quain's 'Anatomy,' vol. ii. pt. i., 10th ed.), it is clear that whatever the power of the muscle, its effect is felt equally in the directions BD and BC, *i.e.* forwards and sideways.

Since the movement of the jaw sideways requires simultaneous movement forwards, it seems probable that the relation of these points A and B to one another will remain constant, whatever be the masticating actions of the jaw.

Internal Pterygoid Muscle (Fig. 3 (*a*))

In Fig. 4, A is the mean position of the points of attachment of the internal pterygoid muscle to the ptery-

goid fossa ; B the mean position of its points of attachment to the internal surface of the lower jaw (Fig. 8 (*c*)). Since A and B are in the same vertical plane at right angles to the median plane, the action of this muscle has no effect in a forward direction ; but as resolved, horizontally and vertically, there is assistance given to the external pterygoid muscle sideways in the direction BC, and to the masseter and temporal muscles in the upward direction CA.

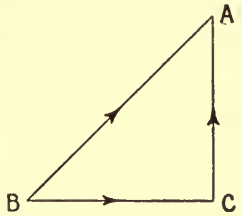


Fig. 4.—Resolution of force exerted in the vert. plane by int. pterygoid.

Concerning the Jaw

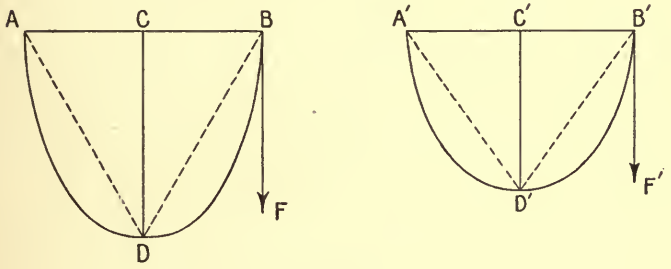


Fig. 5.

In Fig. 5, A and B (or A′ and B′) mark the positions of the condyles of the jaw, D (D′) the position of the symphysis (Fig. 6 (*c*)).

It is clear that movements of the lower jaw about A, if the same upward pressure is exerted, will demand the more force along the line BF the greater the ratio $\frac{CD}{AB}$. The greater this ratio, the greater will be the triturating power of the teeth. It will be with the rough and, in the main, vegetable feeding section of mankind that we shall expect the angle ADB to be small.

Masseter Muscle

In Figs. 6 (*a*) and 6 (*b*), A is the mean position of the junction of the *superficial* masseter with the malar process of

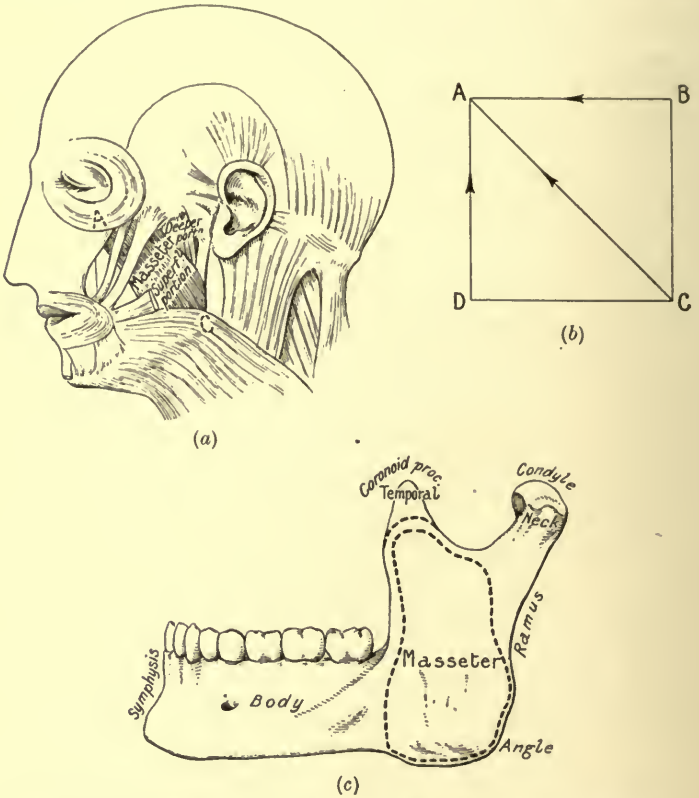


Fig. 6.—(*a*) After Gray. (*b*) Resolution of force in vertical plane. (*c*) Inferior Maxillary Bone, Outer Surface.

the upper mandible, and C the mean position of its junction with the angle of the lower jaw (Fig. 6 (*c*)). In the skull under examination, A and C are in the same vertical plane, and the force exercised by this muscle can be resolved vertically and horizontally into two equal forces. This muscle acts in the direction BA in support of the external

pterygoid muscle; acting in the direction DA it helps to raise the lower jaw against the upper.

Assistance to the external pterygoid will be the greater the nearer the point C is to B.

The action of the *deeper and more muscular* portions of this muscle are upwards and outwards. Its attachments are to the upper half of the ramus and outer surface of the coronoid process on the one hand, to the anterior third and whole inner surface of the zygomatic arch on the other.

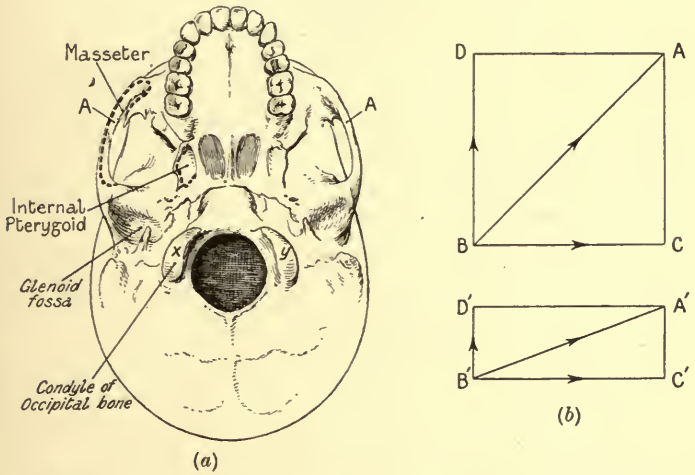


FIG. 7.—(*a*) After Gray. (*b*) Resolution of force in vertical plane.

The pull of the masseter outwards will depend on the distance of the vertical plane through the zygomatic arch from the parallel vertical plane through the point of attachment to the ramus. Thus Fig. 7 (*b*), where A (A′) is the mean position of attachment of the muscle to the zygomatic arch and B (B′) is the mean position of attachment of the muscle to the ramus, makes it clear that the greater the distance BC, the greater will be the force exerted from B to C in relation to the force exerted from B to D. This action will be of peculiar importance when much trituration of food is necessary, requiring a sideways motion of the jaw.

Temporal Muscle

This muscle extends from the inner surface of the coronoid process to the external angular process of the frontal bone and backwards to the mastoid portion of the temporal bone.

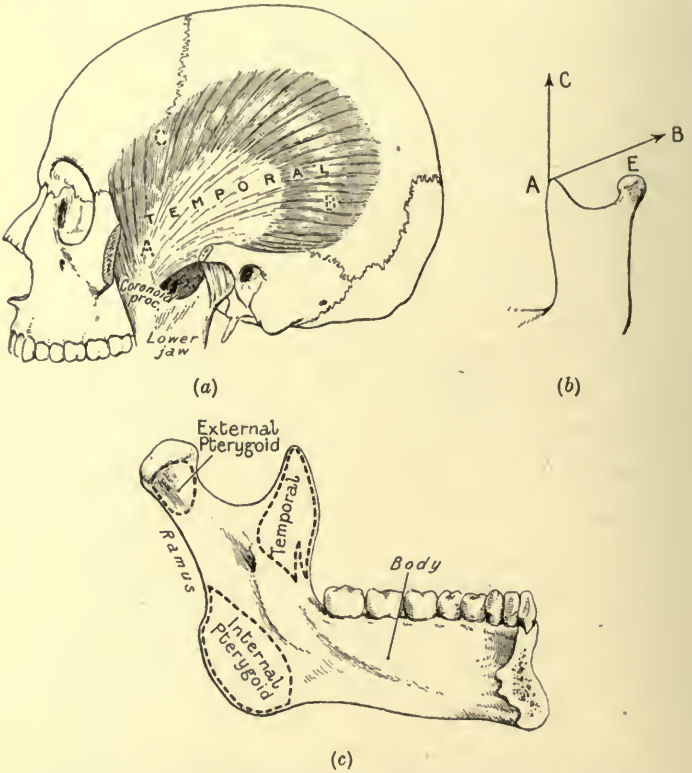


Fig. 8.—(c) Inferior Maxillary Bone, Inner Surface (after Gray).

Its actions are along AC to raise the jaw, and along AB to draw the jaw backwards.

Whether exerted upwards or backwards the force will be the greater the more nearly the side of the cranium to which it is attached is in the same plane with the coronoid process ; and the more extensive the muscle is itself.

The longer the line CD relatively to AB (Fig. 5) the

greater must be the force upwards and backwards to produce the same effect at the point D. The force upwards will be proportional to the distance AE (Fig. 8 (*b*)).

In the case of those peoples who live on rough, uncooked, and in the main vegetable food, we shall expect the temporal muscle to be well developed upwards and backwards; in the case of those who live on cooked food, mostly animal, we shall expect development in the frontal region with short lower jaw: the palate, and so the face, will be narrow in the first case, broader in the second.

The types of actions of the jaw and the muscles governing them are—

1. Powerful for triturating—the superficial and, particularly, the deep masseter; the temporal.
2. Powerful for cutting and holding—the superficial and deep masseter; vertical portion of the temporal.
3. Among civilised peoples, as (1) or (2), in accordance with customary diets.

The most effective shapes of head for these actions will be respectively—

1. Narrow with low cheek bones, wide zygomatic arches, flat sides to cranium, long jaw.
2. Broad with high cheek bones, narrow zygomatic arches, round head because of the special development of vertical temporal (see also next two paras.), short jaw.
3. (*a*) (Mostly triturating; coarse vegetable food.) Narrow head with flattened sides.
   (*b*) (Mostly biting; soft food.) Round head.

The skull is almost exactly balanced about the condyles of the occipital bone (*x* and *y*, Fig. 7 (*a*)), on the vertebral column: the balance will only be preserved if the mass of bone in front of the vertical plane through the condyles is balanced by a corresponding mass behind. Again there must be an equal distribution of brain matter on both sides of this vertical plane, otherwise there would be constant strain on the muscles, a strain that would mean waste of energy.

It follows then that those with long and narrow jaws, the most serviceable for triturating purposes, will have long

heads or heads which though narrow and long in the frontal region are broad behind the ear-holes—those who make much use of the vertical portions of the temporal muscle and considerable use of the horizontal portion of the same being in this latter category. Those with wide and short jaws will be short-headed.

In Appendix II. to his work 'The Races of Man' Deniker separates mankind into a number of ethnic groups on the basis of cephalic index. The groups are as follows:

Dolichocephals, below 77 (S.[1] 75); Sub-Dolichocephals, 77–79·6 (S. 75–77·6).

Mesocephals, 79·7–81·9 (S. 77·7–79·9).

Sub-Brachycephals 82–85·2 (S. 80–83·2); Brachycephals 85·3–86·9 (S. 83·3–84·9); Hyper-Brachycephals, 87 (S. 85) and above.

In order that the reader may judge how far the deductions set down in these pages are in accordance with facts, there are given here some data with respect to the food—and the manner of its preparation—of certain hyper-Brachy- and Brachycephals, Dolichocephals and Mesocephals. All the tribes mentioned in Deniker's lists concerning whom I have the necessary specific information are referred to.

Hyper-Brachy- and Brachycephals.

Kirghiz-Kassaks (384 L. 87·2), of the Tian Shan Highlands and the Great Pamir. Staple diet, yaks' milk and boiled mutton. Their various grain food is eaten in the form of a mush fried with fat. Their larders are stocked with milk and cream in many forms, balls of curd being dried for use in winter or on travel.

Lapps of Scandinavia (105 L. 87·4). What the sheep is to the Kirghiz-Kassak, the reindeer is to the Lapp. They have nineteen methods of treating milk, on which, with flesh, they mainly live. They boil their meat very thoroughly. Their farinaceous food consists of a baked cake as thin as parchment, made from a mixture of barley meal and chaff.

Aleuts (36 S. 84·8). They live almost exclusively on raw seal and sea otter, the blubber of sea-lion and whale, and fish.

[1] S. skull; L. living.

Their islands produce roots and berries; but to procure vegetable food demands too much of their sluggish temperament.

Tahiti (20 L. 85·5). Staple food: the pulp of the roasted bread-fruit. This fruit (2–3 crops each year) provides the Tahitian with sufficient food for three-fourths of the year. It is preserved against the time of want: the fruit is crushed, the core and rind removed, and the mush fermented. Taro root, which when baked somewhat resembles the Irish potato, is, next to the bread-fruit, their most serviceable food. They have the banana and arrowroot, the starch of which is cooked to a jelly with cocoanut milk. Fish and shell-fish are abundant; carefully cooked, they are eaten by all classes.

Araucanians of the Argentine Republic (100 S. 83·9). They live as nomadic shepherds: their flocks consist of cattle and sheep, on the milk and flesh of which they mostly subsist.

Nogai Tatars (16 L. 85·8). Koumiss or fermented mares' milk forms the most important part of the dietary of these Caucasian nomads during seven months of the year. A man will take two gallons at a sitting, and the same quantity again after some hours. They have millet, oats, and maize. The diet of a poor man is as follows: morning, tea and bread; dinner, a meat pasty—generally a paste fried in fat—with macaroni, sour milk, and thick boiled cream; supper, a porridge of shelled millet.

Bavarians of Old Bavaria (1000 S. 83·2). In the highlands 'Nothing but "schmarren," always schmarren and good fresh water.' Schmarren is made thus: Flour is mixed with water—sometimes the yolk of an egg is added—and stirred. Lumps of butter are heated in a frying pan—5 lb. of butter a week is a man's allowance—and the batter is added. When browned on one side, the cake is turned and chopped into pieces of the size of a filbert. An apple is sliced in, more butter added, all well stirred up together, and when every little piece is brown, it is ready for eating.

Armenians of Transcaucasia (270 L. 85·6). Their riches consist largely in sheep. Their bread is cooked in thin cakes like soft leather, or in small thick cakes. These cakes are baked every day. At every meal they eat green vegetables. The flesh of the sheep is most highly prized; but the poor, as a rule, must content themselves with cheese instead. They preserve flesh against the time of want.

Taranchi of Russian and Eastern Turkestan (333 L. 86·6). Their staples are mutton and rice. Favourite dishes are a soup containing flour dumplings filled with hashed meat and spices, rice boiled in sour milk (in summer time), a mixture of flour, fat, and water (for winter), biscuits baked in fat (for travel), and brick tea, taken in the form of a soup mixed with salt and butter.

Bicols of Luzon (Philippines) (16 L. 86·6). An ordinary individual consumes at the three daily meals $\frac{3}{16}$, $\frac{3}{8}$, $\frac{3}{16}$ of a litre of rice respectively. The necessary quantity of rice for each meal is pounded by a woman and is then half cooked—such is the manner of treating rice in these parts where this grain forms a staple article of diet. The Bicols have, moreover, an inexhaustible supply of sweet potatoes, and also fish and shell-fish.

Sundanese (West Java) (21 L. 86·3; 18 S. 85·5) and the Burmese of Arakan (13 S. 83·7) have rice as their staple food.

Siamese (17 S. 83). Their staple is rice. This is washed four or five times, boiled for three minutes, and the water is then poured away. The pot is placed on a slow fire for steaming. Eels furnish material for fish curry.

Tungus-Orochons (16 S. 83·4). They live mostly by reindeer breeding and by fishing. They will eat flesh or fish in any state. 'I have repeatedly seen a Yakut or Tungus,' said Cochrane, 'devour over 40 lbs. of meat a day—three will consume a reindeer at one meal.'

Galchas (Russian Turkestan) (56 L. 85·5). They subsist, in the main, on milk and its products. They have some grain, and mulberry flour is an important item in their diet. Soup containing beans, or boiled mutton, or lumps of boiled flour, or dried milk, is the form in which they usually take their food.

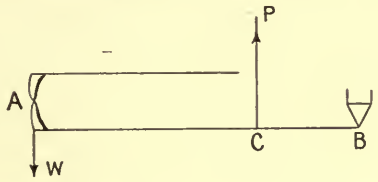
Lesghians of Dagestan (130 L. 86·2). They have little fertile land. Their whole riches consist in their flocks of sheep.

It is obvious that in the case of the peoples referred to above the important actions of the jaws through the teeth are to *hold* and to *cut*. Regarding the lower jaw as a lever with its fulcrum at the condyle B, these actions will occur mainly about the point A, the power being applied at the point C.

If W represents the pressure exerted by the lower incisors on the upper at A,

then $W.AB = P.CB$.

The force P of the muscle and the distance CB remaining constant, the pressure W will increase as the distance AB



diminishes. In the case of a number of jaws Thompson (*J.A.I.* xxxiii. 135) found the following values for the mandibular index :

$$\left(\frac{\text{Condylo-symphysial length} \times 100}{\text{Inter-condylic width}}\right):$$

from 13 brachycephalic skulls,	average index		84·8
11 mesocephalic	,,	,,	88·9
20 dolichocephalic	,,	,,	90·6

evidence that it is the brachycephalic people who have intercondylic widths that are relatively large, whose jaws therefore find their most effective movement in a vertical plane.

DOLICHOCEPHALS.

VITI LEVU (Fiji) (73 S. 67·2). The natives raise large quantities of taro (their staff of life), yams, bananas, sweet potato, and sugar-cane. In the uncultivated districts they find large supplies of edible wild roots and fruits. Near the coast they have fish and shell-fish, some of the latter ' proof against other than Fijian powers of mastication ' (Pickering). At a public feast there were displayed, among other things 50 tons of cooked yams and taro, 15 tons of sweet puddings, 70 turtles, 200 tons of uncooked yams. One pudding measured 20 feet in circumference.

NATIVES OF THE CAROLINE ARCHIPELAGO (204 L. 69·4). In the low islands the staples are cocoanut and bread-fruit, in the higher, taro with other tubers and bread fruit. They have fish and shell-fish in abundance.

NEW CALEDONIANS (204 L. 69·4). ' The articulating surface of the condyle of the lower maxillary among the Parisians is long and narrow,—the condyle almost of a carnivore ; among

the New Caledonians, the condyle is almost as broad as it is long; it is the condyle of a herbivore, allowing ample lateral movements.' M. Bertillon says: 'The bilateral flattening is related to the development of the bilateral muscles covering the parts, which are thus flattened. . . . It is the vegetable regimen then, compounded of matter, the laborious and difficult trituration of which is proved by the wearing of the large teeth and flattening of the condyles, that makes the Caledonians scaphocephalic.'

The Paradise of the Caledonians is a place where one can eat when one is hungry, and where there are yams. In the deserts they eat anything they can find—goats, birds, rats, roots, fruit, sugar-cane.

Australians of Queensland (10 S. 72·2). In the main they have a vegetable diet, consisting of the seeds of various plants—ground and eaten, cooked or raw—roots, tubers, young shoots. In addition they have occasional feasts of wallaby, eggs, snakes, fish, etc.

Papuans of the Fly River (New Guinea) (24 S. 74·2). Their food consists mainly of sago, always roasted in rolls and mixed with clams, fish, cocoanut, or banana. They are inveterate betel chewers, the 'quid' being kept in the mouth day and night. 'Gamada,' a drink made by chewing the root and stem of *Piper methysticum*, is much favoured.

Tasmanians (25 S. 74·9). In addition to fish and flesh they had a large variety of vegetable food—fern root, fungi, truffles, etc. Roasting was their only mood of cooking: their food was 'done' when heated through.

Badagas of the Nilgiris (95 L. 71·8). Husbandmen, some of whom live entirely on vegetables—they are very partial to cabbage and the root of a certain nettle—others on millet and rice. These grains are boiled or very commonly parched. In this form they are used especially by labourers and travellers, who are unable to cook food when it is required.

Kolarians, N.W. Provinces (685 L. 72·7). 'Certain of these tribes (those in Orissa) are distinguished . . . by zygomatic arches projecting outwards, . . .; . . . they live on the products of the chase and the fruits and roots gathered; they also practice a little primitive cultivation. . . .' (Deniker).

Todas of the Nilgiris (45 L. 74·1). Rice, ragi—eleusine coracana, the staple grain of the Mysore country—or millet furnish these shepherds with much of their food. The grain is boiled with water or whey. Ragi is a poor food, difficult to digest, and the flour is made into a semi-solid cake. The Todas eat the roots and stalks of a thistle, the shoots

of a nettle and of the bamboo (as curry), and sundry pot-herbs.

Veddas of Ceylon (55 L. 75·1; 43 S. 71·5). Skilful hunters and fishers who have plenty of edible fruits and roots at command. In times of scarcity they eat rotten wood soaked in honey. It is but a few years since that they began to cultivate small tracts of land for grain.

Irulas of the Nilgiris (58 L. 75·1). Half-savage tribes of the jungles living on ragi and millet, which they obtain by barter, and fruits; they will eat any flesh but that of buffalo.

Hindus of Bihar (695 L. 75·7). Nowhere in this district can the poor daily procure rice, and for much of the year they live on wheat and other coarse grains, or even on pulse, which is largely eaten uncooked.

Bakongo (14 L. 72·5). Their diet is almost entirely vegetable—palm nuts, sweet potatoes, beans, cabbage or manioc tops, plantains, ground nuts; manioc (tapioca) is their staple.

Hottentot-Orlans (15 L. 74·3). They live on yams, on milk in its various forms, and on wild fruits, roots, and berries.

Fulahs or Fulbés of W. Africa (37 L. 74·3). Shepherds of the highlands of Senegambia, who are also husbandmen. In addition to milk and some meat from their flocks, they have rice, maize, millet, haricots, sweet potatoes, and various fruits.

Wolof, Serere, and Leybous of W. Africa (29 L. 75·2; 13 S. 69·8). The staple food is 'cous-cous,' made by steaming granules of millet flour; this is eaten with fish or flesh and legumes. Sometimes, instead of 'cous-cous,' they eat rice, maize, or haricots. Maize and arachid nuts are grilled on the coals. All chew the kola nut.

Kafirs (56 S. 72·5). Sorghum or maize, cooked, beaten and eaten with milk, is their staple food. There is so much grit in their ground corn that it frequently makes Europeans dangerously ill. They have moreover sweet potatoes, yams, sugar-cane, etc.

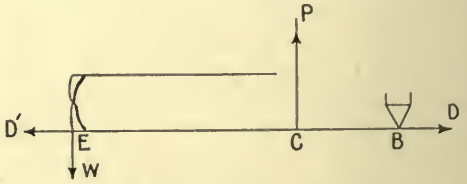
Hurons (76 S. 74·7). Their staple food was maize; on the war path they took with them corn meal and whole corn. In addition to game and fish they had ground peas and, in times of scarcity, shavings from the bark of the sugar maple.

Eskimo of Greenland (614 L. 76·8; 31 S. 32·4). In the main they live on seals and fish. When in want they eat seaweed and tender skins boiled in train oil. The skin of the whale, with its layer of blubber, tough as rubber, is to them a

delicious repast; also the skins of seal and halibut. The women and children spend much time chewing bird skins for articles of attire, and tough skins for their tents.

Botocudo (10 L. 76·8; 33 S. 73·9). In the dry season, when game is scarce, they live on chestnuts and cocoa (boiled or roasted), on the seeds of the 'pot' tree and the tops of the cabbage palm. They have fish in addition.

The most important actions of the jaw among these dolichocephalic peoples are to grip and to grind or gnaw. The force required to move the jaw in the directions BD and BD′ will be the greater, the greater the force with which the lower jaw closes on the upper. If this force remains constant, the triturating power of the jaws will depend on the distance CE.



As far as the vertical force exerted by the temporal muscle is concerned $P \times CB = W \times EB$.

It is found that the higher coronoid indices

$$\left(\frac{\text{Condylo-coronoid width} \times 100}{\text{Condylo-symphysial length}} \text{ } i.e. \frac{BC \times 100}{BE} \text{ in the diagram}\right)$$

are usually associated with dolichocephaly, the lower with brachycephaly. We have learnt already that the mandibular index is greater in the former case than in the latter.

To assist, therefore, in making up for a loss of grip due to the lengthening of EB, there is an increase in the distance CB.

In conclusion the reader is asked to compare the food of the following mesocephalic peoples with that of the brachycephalic peoples on the one hand, and with that of the dolichocephalic peoples on the other.

Bakairis of Brazil (10 L. 79). In spite of agriculture they live in the atmosphere of the hunter, and have a supply of flesh and fish—flesh is always baked, never boiled—but their staple food is manioc (tapioca). They have, moreover, sweet potatoes, yams, and earth nuts.

Pawnees (84 L. 80; 105 S. 78·8). They had much buffalo and deer, but their staple food was maize. The order of preference in respect of cooking meat was broiling, roasting, and boiling. When maize reached the edible stage the ears were roasted in pit ovens, and, after the feasting, the surplus of corn was dried. The mature grain was milled raw and parched. The grain was soaked in a lye from wood ashes to remove the horny envelope, and was then boiled, forming hominy; this was often dried, parched, and ground, and then consumed dry or as a gruel.

Bororo (20 L. 81·2). They have no agriculture. Their staples are flesh and fish, but by barter or by the labours of their women they procure maize or palm nuts and roots.

Chinese (125 S. 78·3). Steamed rice is the daily food of the poor, with boiled cabbage, and a little raw turnip pickled in brine as a relish. They have an occasional dessert of water-melon seeds. In summer an industrious workman will have in addition raw cucumbers, raw carrots, and perhaps a melon.

Nicobarese (36 L. 80·4). Pandanus dough with grated cocoa-nut and sometimes a piece of chicken or pork constitutes their usual meal.

Battas of Lake Toba (58 L. 80·6). A pot of rice twice a day is the customary food of the moderately well-to-do. The poorer classes have as their ordinary diet fruit (bananas on the uplands, cocoanuts on the coast), corn, and roots.

Chinese of Canton (61 L. 81·2; 84 S. 78·2). The meals of the poorest class consist of rice. A dumpling boiled in a syrup is one of the chief articles of wayside cookery: a favourite sort is one mixed with minced meat. Fowls, rice, and vermicelli are dressed in the streets for those who cannot afford a meal at home.

Andamanese (19 L. 81·4; 24 S. 78·2). Their food is mostly boiled—a considerable portion of it consists of flesh.

New Ireland (12 L. 81). They are well supplied with animal food, but their staples are yams, taro, sweet potatoes, and bread-fruit.

Georgian-Migrelians and Immers (67 L. 81·4). Maize and millet are their chief grain. The maize is eaten in the form of a small round cake, cooked every day, the millet as a very stiff gruel. This latter is the daily nourishment of the people. They have plenty of honey, and eat flesh frequently, though not daily.

Keane in his 'Ethnology' (p. 177) writes: 'With the shape and size of the skull as racial tests we seem to enter debatable

ground. . . . With regard to the shape . . . it may be admitted that no physical character has been more extensively studied with, on the whole, such indifferent results. Hence the emphatic protests that have been uttered by Wallace and some other eminent ethnologists against craniology as affording trustworthy data for ethnical classifications.'

On page 110 of the same work he speaks of the chief differences between the two ages—Palæolithic and Neolithic—thus :

Palæolithic Culture	Neolithic Culture
'*Human types* mainly dolichocephalous, but brachycephalous also in some places (S. America ?).	*Human types* at first mainly dolichocephalous in Europe, later mixed and diversified as at present everywhere.
Fire, at first known only, later partly under control—could be preserved when kindled by natural means.	*Fire*, under more complete control—could be artificially kindled and preserved.
Food, at first mainly vegetable, then animal also, mostly perhaps eaten raw ; obtained by hunting and fishing only.	*Food*, vegetable and animal, the latter mostly cooked ; obtained by hunting, fishing, stock-breeding, and tillage.
Cultivated plants, none.	*Cultivated plants*, numerous : cereals, vegetables, fruits.'

Keane brings together much information respecting human remains belonging to various palæolithic epochs and 'while all without exception are dolichocephalic (index varying from about 70 to 75) ; . . . when all the evidence is sifted and correlated, it will probably be made manifest that dolichocephaly even of a pronounced type persisted far into neolithic times, and that it was only very gradually first modified and then replaced *in some regions* [1] by brachycephaly.' [2]

[1] The italics are mine; but they are used by Keane later in the same connection.

[2] The 'Longbarrow' men of Britain of the Stone Age had a cephalic index of 71 ; the 'Roundbarrow' men of the Bronze and Iron Ages had an index of 81. According to Rice Holmes the main occupation of the latter was pasturage. The Caledonians (average cephalic index of ten skulls 85·39) lived on the milk of their flocks and wild fruit.

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