Cocoa : its growth and culture, manufacture, and modes of preparation for the table accompanied by easy methods of analysis, whereby its purity may be ascertained / by Charles Hewett.

Contributors

Hewett, Charles.

Publication/Creation

London : Simpkin, Marshall, 1862.

Persistent URL

https://wellcomecollection.org/works/b2xxq9sn

License and attribution

Wellcome Collection
183 Euston Road
London NW1 2BE UK
T +44 (0)20 7611 8722
E library@wellcomecollection.org
https://wellcomecollection.org

21-

Cocoa Plantation in the Island of Grenada

With the Author's Compliments

CHOCOLATE AND COCOA.

COCOA;

ITS GROWTH AND CULTURE, MANUFACTURE,

AND

MODES OF PREPARATION FOR THE TABLE.

Illustrated with Plates.

ACCOMPANIED BY

EASY METHODS OF ANALYSIS,

WHEREBY ITS PURITY MAY BE ASCERTAINED.

BY

CHARLES HEWETT,

OF THE FIRM OF DUNN AND HEWETT, CHOCOLATE AND COCOA MANUFACTURERS,
PENTONVILLE, LONDON.

LONDON:
SIMPKIN, MARSHALL, & CO., STATIONERS' HALL COURT.

1862.

DEDICATION.

To the Future Wives of England.

In offering the following Treatise to your notice, it may not unreasonably be expected that we shall explain why we have dedicated it to you, and why we solicit your careful perusal of its pages.

It is a common complaint that the matters of study open to Ladies are extremely limited in their range, and that many of the subjects in which they naturally feel a strong interest are placed altogether beyond their reach. The science of human life, the means by which it is preserved, the adaptation of articles of ordinary diet to the ordinary wants of the body, the action of our food, and the means by which our frame is built up and kept in healthful activity,—all these, and many kindred topics of deep interest to every wife and mother, have, till very recently, been locked up in the technical nomenclature of medical science; or have been

found only in works which, from the nature of their contents, are fitted only for the medical student.

This little work, also, may help to supply a want of employment frequently and generally complained of by young ladies during the last few years they spend under the parental roof. Domestic chemistry, whether followed as a study or as an amusement, possesses numerous charms, and offers to its followers much both of use and pleasure. Its pleasures are obvious; and its uses are to be found in the fact, that, if the articles of diet were to be analysed by some simple process, not only would a large amount of expense in the family be saved, and a greater amount of health secured, but the experience would be gained by which a genuine article could be distinguished from a spurious and adulterated one, and thus a great and powerful check be introduced against dishonest dealing, which always calculates upon the ignorance of the consumer.

We offer this, then, as the pioneer of a plan (which we would fain hope will be followed by others), the object of which shall be the spread of truly philosophical principles in their adaptation to common life, and the aim of which shall be to raise the science of alimentation above the mere gratification of appetite, by teaching

the public the advantages of studying the *uses* rather than the mere acquired *flavour* of their food as the best means of preserving "a sound mind in a sound body." If we have too far left the beaten track, our only apology is, our desire to make ourselves perfectly intelligible.

Allow me, then, most respectfully to dedicate this little Treatise to you, in the hope that it may open to your minds higher views of the exalted duties of "home," and point to a useful employment of your talents in that circle which is especially the province of woman, and where, assuredly, is to be found one of her noblest missions,

And to subscribe myself,

Your obliged Servant,

The AUTHOR.

CONTENTS.

COCOA:

ITS GROWTH AND CULTURE, MANUFACTURE,

AND

MODES OF PREPARATION FOR THE TABLE.

SECTION I.

INTRODUCTORY REMARKS.

The study of articles of food is a new one to the public, and to Dr. Playfair and Dr. Lankester, the late and present Superintendents of the Food Department of South Kensington Museum, belong the credit of having brought the subject prominently forward. Previously to the arrangement of the Food Collection in that Museum, little was known by the bulk of the people of the importance and relative value of dietary substances; medical and physiological works being, on account of their price and of their scientific or technical language, either beyond their means or above their comprehension.

Till within the last few years, during which cocoa has been extensively patronised by the faculty, the use of choco-

late and of cocoa depended almost entirely upon the fact, that they produced a most agreeable and palatable drink, —their physical advantages being unknown or overlooked.

In publishing some of the results of our own experience, we hope to show that Chocolate and Cocoa, in any form, subserve purposes in the animal economy to which Tea and Coffee, the ordinary drinks of the masses, can lay no claim. In doing this we shall, as far as practicable, eschew all technical terms, and endeavour to make ourselves understood by our readers; for as we do not write for manufacturers nor medical students, minute exactness is not necessary for our purpose.

Cocoa has suffered more than almost any other article from public ignorance. A few years since little was known, except to the initiated few, respecting the Cacao plant. In the minds of most people it was confounded with two other trees, the Cocoa-nut Palm (*Cocos nucifera*), and the Cocoa Shrub (*Arum esculentum*). The first of these is the most interesting specimen of the genus *Cocos*. It is found in the tropical regions of all parts of the world, but generally on the sea-board, or within reach of salt water, and rises to from seventy to ninety feet in height. It is crowned with a head of from twelve to fifteen leaves, twelve or fourteen feet in length, two of which fall off every year, and produces the well-known cocoa-nut, enveloped in a valuable woody fibre. The *Arum esculentum* is a plant belonging to the order *Aroidiæ*, the underground stems of which, roasted or boiled, are occasionally eaten. The cuckoo flower of our own fields belongs to the same order. In consequence of a confusion in the name these have been frequently supposed to be the trees from which cocoa is obtained, and the error may, perhaps, be principally due

to the secresy with which the manufacture of the article was carried on for a long period by the Spaniards, who first introduced it into Europe. We shall show, however, that cocoa is derived from a totally different class of plants from either of these.

The name given to the plant by the father of botany, Linnæus, was *Theobròma*, from Θεὸς *God*, and *βρῶμα food;* and this name he, in his fondness for the substance, imposed upon it, in allusion to the solid food offered by heathen nations to their gods: and to this he added the ordinary or native name of the tree, *Cacao*, and its proper designation, therefore, is

THEOBRÒMA CACAO (*Linn*).

SECTION II.

BOTANICAL DESCRIPTION OF THE THEOBROMA CACAO.

The *Theobròma Cacao* (see plate 1.) is a tree belonging to the natural order *Byttneriaceæ*, and was formerly included in that of *Sterculiaceæ*. It is a small, and handsome evergreen tree, not unlike the cherry, rising naturally to about thirty feet in height, though in a cultivated state it is not permitted to grow so high. Its leaves are about seven inches in length, and may be described as elliptic-oblong and acuminate, and are quite smooth. They principally grow at the upper part of the tree or at the ends of the branches, leaving a bare headed trunk. The fruit and flowers, instead of growing as usual on a spur attached to the tender twigs and branches, and intermixed with the foliage, are borne immediately on the most solid parts of the stem and main branches, and thus, at first sight, appear to be artificially placed there, rather than growing.

"The flowers (see plate 2.) are very small and clustered; the calyx is composed of five sepals, petals five, lengthened into a strap-like form at the apex, the stamens five, with double anthers, and a horn-like appendage between each filament; style filiform, with a five-parted stigma, of a yellow colour, turning to pinky violet. The fruit is five-celled, without valves, seven to nine and a half inches in length, and three to four in breadth, of an elliptical oval pointed shape, something like a vegetable marrow, only more elongated and pointed at the end, tough and quite

Plate 2.—A branch of the Cocoa tree, with pod and flowers. A pod opened shewing the seeds or fruit.

smooth, the colour varying, according to the season, from bright yellow to red and purple. The rind of the fruit is very thick, and similar to a very hard tough apple in substance, but quite tasteless; if allowed to ripen, this changes into a shell of a weak nature. The seeds contained in each pod vary in number from twenty to forty, embedded in a soft, pinky white, acid pulp."

The bean or seed itself (see plates 2. and 3.) is also invested in a husk or shell, consisting of three or four distinct membranes, of different characters; and, deprived of this husk, the seed is found to consist of several parts or lobes, angular in form, but of irregular shape. These are also separated from each other by a very thin membrane (see plates 6., 7., and 8.), and are capable of being parted by pressure. When roasted and so separated these form "Cocoa Nibs." They consist of a large number of very minute cells, filled with fatty matter and corpuscles of starch, or amyline. The *embryo* is placed at one end of the seed.

Its *habitat* may be described as being between the fifteenth parallels of latitude in South America. We may presume that this is its native country, because there alone it is found in a wild state. Whole forests of the Cacao exist in Demerara. It was also originally introduced into Europe from this district. It is capable, however, of being cultivated in other countries up to the twenty-fifth parallel of latitude, though not on a sea coast exposed to an easterly wind, which is always unfavourable to blossom, or generally on ranges less than 500 feet above sea level.

In cultivation, the range of the Cacao has necessarily been extended, as is the case with all productions, both animal and vegetable. But with acclimatization certain changes take place, and these almost seem to constitute different varieties. Though it is probable that Mexico was

its first home, it is now more or less extensively grown throughout the central region of America, Brazil, Peru, Venezuela, Caraccas, Ecuador, Grenada, Demerara, Essequibo, Guayaquil, and Surinam; with some of the West India Islands, foremost among which stands Trinidad. It has also been introduced, with more or less success, into Africa, the Mauritius, Madagascar, the Isle de Bourbon, the East Indies, Australia, and the Philippine Islands. We receive the principal part of our supply, however, from Trinidad and Grenada. And it seems that the mountainous regions of Grenada, one of the lesser Antilles, which run through the island from north to south, forming on the west most fertile slopes and valleys, and the delightful climate of Trinidad, the most westward of the Windward Islands, offer sites of the most surpassing loveliness and fertility, peculiarly suited for the growth of this tender tree, and admirably adapted to bring its fruit to perfection. Two kinds, however, are known in each of these islands. In Trinidad they are known as *Cacao Forastero* (or foreign), and *Cacao Creole;* and in Grenada, the first is known as *Caraccas*, whence it was originally introduced, and the second as *Creole Cacao*. Still, it is not improbable that they are but varieties of the *Theobròma Cacao*, and the differences may be due to accidental causes, or to various methods of cultivation. At any rate they are closely allied to each other; but the fruit borne by the *Caraccas* is longer and thinner than the other, with a thinner rind, and a larger number of seeds; and these seem rather to be indications of longer or superior culture, than difference of species. The seeds are also plumper and larger than the *creole*, at the same time that their flavour is better; while the latter possesses a larger amount of fatty matter in proportion to their bulk.

SECTION III.

HISTORY OF THE USE OF CHOCOLATE AND COCOA.

The Cacao was cultivated by the aboriginal inhabitants of South America long before that continent was discovered by Columbus; and the value which was attached to the plant is evinced by the fact, that from time immemorial the seeds were employed in some parts as the circulating medium.

The earliest recorded account of its use, however, is that supplied to us by Columbus, who brought home samples of this delicious food in 1520. According to Prescott, the Spaniards found Montezuma drinking chocollatl out of golden goblets, flavoured with vanilla, and reduced to a froth of the consistence of honey.

The method which the Indians adopted in the first making of chocolate was to roast the cacao in earthen pots; when, having cleared the nuts of the husks, and beaten and bruised them between two stones, they made them into a paste with their hands, the heat of which was sufficient to melt the fat or butter.

The Spaniards, however, improved upon this original and simple method, and after roasting and cleaning, ground the pulverised mass on hot stones with any other substance with which they wished to flavour it.

From Spain, where the manufacture was long kept a profound secret, so delightful a beverage was not long in

finding its way through the Continent and to England. But the Spanish merchants, though they monopolised the growth and manufacture, preferred the receipt of exorbitant profits to statistical accounts; and hence we shall probably never know how small a quantity of this delicious substance satisfied the wants of our forefathers.

It is certain, however, that up to a comparatively recent period the use of cocoa in this country was extremely limited, not from the foregoing reason only, but also from the high duties exacted on its importation. The entire consumption in 1820 was no more than 276,321 lbs. Not satisfied with prohibiting the introduction of chocolate from any part beyond the seas, the article was still further hampered by the presence of the inland revenue officer, who required that it should be made up in papers which he supplied, each containing one pound, for which the pound of chocolate was mulcted 1s. 6d. Private families, however, were kindly *allowed* to make their own, on payment of the same inland duty, by giving three days' notice to the excise officer; but it was specially provided that they *should not be allowed to use less than half a hundredweight of nuts at one time!* No wonder, therefore, that at that time chocolate or cocoa was a dish for the rich, not only high in price, but also very difficult of preparation for the table. These objections kept it beyond the reach of the masses, and caused it to be regarded as a *luxury* rather than as a *necessary* of life.

One of the earliest advertisements we have met with in reference to the use of chocolate in this country, is to be found in No. 572 of an old newspaper called *Needham's Mercurius Politicus*, under date, June 16—23, 1659, which is as follows :—

"Chocolate, an excellent West India drink, sold in Queen's-Head-alley, in Bishopsgate-street, by a Frenchman, who did formerly sell it in Gracechurch-street and in Clement's-churchyard; being the first man who did sell it in England. There you may have it made ready to drink, and also unmade at easie rates, and taught the use thereof, it being for its excellent qualities so much esteemed in all places. It cures and preserves the body of many diseases, as is to be seen by the book, who hath it there to be sold also."

But though chocolate was thus early introduced into this country, and was "so much esteemed in all places," its consumption by no means increased in the same ratio as tea and coffee. This may in part have arisen from its advantages as a drink not being known; in part it may have arisen from a fact to be hereafter noted and explained, that it is too rich to be used freely with a large amount of animal food, the custom of our forefathers; but no doubt a great part of its want of favour was due to the difficulty with which it was prepared for the table. For while tea and coffee were almost instantly prepared, some kinds of cocoa took five or six hours; and even the chocolate itself required considerable time and considerable experience to render it acceptable to the palate.

We need not be surprised, then, that under such circumstances cocoa advanced very slowly in public estimation. In a great measure the consumption of any article depends upon its adaptation to, and acceptation by, the masses of the people; and for them the method of preparation was sufficiently tedious and tiresome to exclude cocoa from becoming a popular drink.

In the endeavour to make cocoa available as a drink for

the bulk of the people, Mr. Daniel Dunn (the senior member of our firm) conceived the happy idea of making such a preparation of cocoa as should require the simple addition of *boiling water* to prepare it for the table, by which it would be placed on a level with tea and coffee. Prior to this time all cocoa and chocolate required to be *boiled* and *milled*.

In pursuing his investigations he found that chocolate and cocoa (the differences between which will be found in Sec. xvii.) were taken in the form of an emulsion, the particles being mechanically suspended in the water, such suspension being due to the boiling and milling. Two methods of rendering them soluble occurred to him; both, however, depending on producing an easy method of disintegrating the cocoa, or separating it into minute particles. The first was to grind the nibs with some article more readily soluble than cocoa, or more easily suspensible in water. If thoroughly pulverised and incorporated, the solution of this article, occurring between the particles of the cocoa, would at once liberate them, and they would become mixed with the water. Loaf sugar was the substance he found most perfectly accomplished this object. The second method was to grind the nibs with some substance which should reduce it to a *powder* instead of a *paste*, an *impossibility* without the admixture of some other substance, in consequence of the large amount of fat. His plan was, therefore, to add a dry powder which, while beneficial and nutritive, should absorb a portion of the fat, and thus disintegrate the cocoa. This plan, he found, had the advantage of producing an article free from the objection to which cocoa was liable on account of its richness. *Arrowroot*, he found, was the best substance for this purpose, and accordingly in 1819, he *perfected* the idea of which he

was the *originator*, and issued articles, first under the name of "Chocolate Paste," and some years afterwards under those of "Soluble Chocolate," "Chocolate Powder," and "Soluble Cocoa." The same plans have since been adopted by other makers in consequence of their success.

This mixture is not, however, to be regarded as an *adulteration* of cocoa. Strictly speaking, cocoa, as well as chocolate, is a *manufactured article*, and the name of the *raw material* is cacao, not cocoa. The arrowroot and sugar are only added to accomplish certain results,—to render it emulsive. We have appended a chapter on "Cocoa and its Powers of Combination," in which the dietetical reasons for adding arrowroot are fully explained, so that it is unnecessary to enter upon them here. We have also added another chapter upon a combination, to accomplish which we spent years of labour, that with *Lichen Islandicus*, or Iceland Moss, of which also, though since imitated by other makers, *we were the originators*.

Other substances are added to cocoa, which render it more or less injurious, we therefore append a short chapter on "Analysis, with Tests," by which the presence of all substances with which cocoa is usually adulterated may be readily discovered. For these substances we shall take the account of the "Lancet Sanitary Commission" on the adulteration of food. For ourselves, it will be sufficient to refer our readers to the certificate of Dr. Normandy (author of *The Commercial Handbook of Chemical Analysis*, and many other chemical works), to be found on another page, with the condition, a penalty of £50, annexed to it. When cocoa could thus be prepared for the table *in one minute*, with no other trouble than pouring boiling water over it, a new era was opened for its use. Not only now

could it be presented at a lower price (a very great advantage to the poor), but it required neither apparatus nor time; it was not necessary that a man should decide over night whether he would take cocoa for breakfast: it was even more readily prepared than tea or coffee, and the chief obstacles to its use were at once removed. Cocoa had heretofore been a *luxury*, attainable, indeed, by the rich, but practically inaccessible to the poor. By D. Dunn's method of preparation, it was placed within the reach of the latter classes, offering them advantages of no slight character. For while tea and coffee, nourishing, valuable, and refreshing though they be, are essentially *drinks*, cocoa is more like solid food in its composition, and, therefore, of more moment to the classes who are compelled to regulate their appetite by their pockets, and who frequently cannot obtain sufficient alimentation to satisfy hunger, or supply the daily waste of the body.

SECTION IV.

GROWTH OF THE CACAO NUT TREE, AND PREPARATION OF ITS FRUIT FOR THE MARKET.

The prosperity of a country so much depends upon its productions, especially upon such as can be exported, and thus bring money and foreign commodities in return, that we need not be surprised that great attention has been paid to the growth of the *Theobròma Cacao*. Throughout the middle region of South America, however, in which it is most extensively grown, in consequence of the ignorance of the masses of the people, a considerable amount of superstition is mixed up with the circumstances of its growth, possibly some remnants of the heathen lore of the early inhabitants of the New World. Previous to 1690, an effort had been made to introduce it into the West India Islands; but this failed, most probably in consequence of the habits and nature of the tree not being sufficiently studied and understood. When the English took possession of Jamaica, in 1655, they found that the Spaniards, the former masters, had established cacao walks, which they no doubt introduced from Mexico, then a province of Spain. The conquerors took great pains to continue the growth, being, even at that early period, aware of its importance; but they failed. The Spaniards had warily kept their secret; they feared that their slaves would commence planting for themselves, and induced the latter to

believe that the planting was effected by and attended with certain mysterious rites and ceremonies, which they could on no account be permitted to witness. At any rate, very few of the trees planted by the English came to perfection, and the Theobroma eventually disappeared from the island.

The site upon which the Theobroma appears to flourish best, is to be found in hilly regions. These are always intersected with valleys, which have by day a genial warmth, and are protected from the cold winds of night. They are also generally well watered, and frequently the soil is of the richest and finest kind. In Grenada, it is usually planted on the western faces or slopes of the hills, at an elevation of 1000 to 3000 feet. A strong, gusty wind is fatal to the blossom and spoils the crop, and on this account is carefully guarded against in the selection of the site for a cacao walk. Where there is a danger of hurricanes, there is no hope of successfully growing it. In flat places, however, such as the greater portion of the Island of Trinidad, it is necessary to protect the trees at the time of flowering, and recourse is had to one or other of the following expedients. Either the cacao and the coffee tree are planted in alternate rows; or at certain distances a row of the *Erythrina umbrosa*, or *Corellodendron*, called in the country by the name "Bois Immortel," stretches across the plantation. This is a small bushy plant, bearing a brilliant scarlet blossom, whose dark, glossy leaves somewhat like the myrtle, contrast beautifully with the whitish grey bark and glossy golden foliage of the cacao trees. They grow to only a few feet in height, but yet are of immense value in protecting the cacao, not only by breaking the force of the strong winds, but by affording

Plate 3.—View on a Cocoa Plantation in the Island of Grenada.

shelter from such keen dry winds as would cause the bark to crack. It is most important to prevent this, for the tree is infallibly ruined by it. These rows of bushes have also another effect. Consisting, as they do, of very close spreading branches, thickly covered with leaves, by means of their shadow the ground is kept in a damp state, and a gentle moisture rises, which is of immense value to the cacao tree, and prevents the intense heat of the sun from causing the bark to dry and peel off. The importance of this care of the bark may be readily understood from what we have already stated, namely, that the fruit-stalk is attached immediately to it, and not like other fruits, suspended from the twigs.

A deep, porous soil, especially if near a running stream of water, is that in which it flourishes most luxuriantly. Such a soil is much warmer to the roots than a damp clayey one, which, retaining the water, is necessarily cold, and infallibly destroys the roots of the trees.

The land is first cleared of all trees, because if any clumps are left, they have a tendency to produce eddies of wind, and these are unfavourable to the blossom, which is extremely delicate in its nature. This done, the next step is to prepare for planting the seeds; the *cacao* is invariably raised from seeds, and never, like most of our fruit trees, from slips or cuttings. This is generally done from April to June, corresponding to our October to December. The seed has, then, the advantage of the rainy season, and has most probably "struck" before the dry season, beginning with January, sets in. The plant, however, at all times, and especially when very young, is an extremely tender one, and requires the utmost care of the planter. Those who have tried to cultivate a garden

in our own climate know the difficulty of keeping it free from weeds: and we shall see that this is of far more consequence, as well as a matter of greater difficulty, when we remember the rapidity and rankness with which vegetation springs up under a tropical sun; especially those small parasitic plants and mosses which in that climate accumulate upon other trees to a vast extent, and ultimately destroy them. The best method of meeting and overcoming this evil is to keep the land occupied. This the cacao planters do. The rows of the Theobroma are planted at from 10 to 17 or 18 feet apart, according to the richness of the soil, the rich land allowing a greater length of branch. Between each row the planter sows some other vegetables, generally the yam, which yields in its root an excellent substitute for the potato (a climbing plant, running up poles like the hop); the tanya, a somewhat similar plant; the pigeon pea, a bush bearing a pea somewhat like our English one in flavour; or the cassada, the farinaceous matter contained in the roots of which is made into cakes and eaten by the natives. But these supply another very important purpose. They not only keep the ground clear of weeds and supply nourishment, they also, by their umbrageous shade, shelter and protect the young and tender plants of the cacao. The seeds are then dibbed in, usually three close together, so as to provide against failure, and enable the planter to thin out such as are not promising, and select and keep the most healthy ones.

This process of planting between the rows is continued for three years, great care being constantly taken to keep the walk free from weeds. The tree then comes to bearing state. It is then trimmed and pruned to three or four primary or leading branches, all others being cut in; and

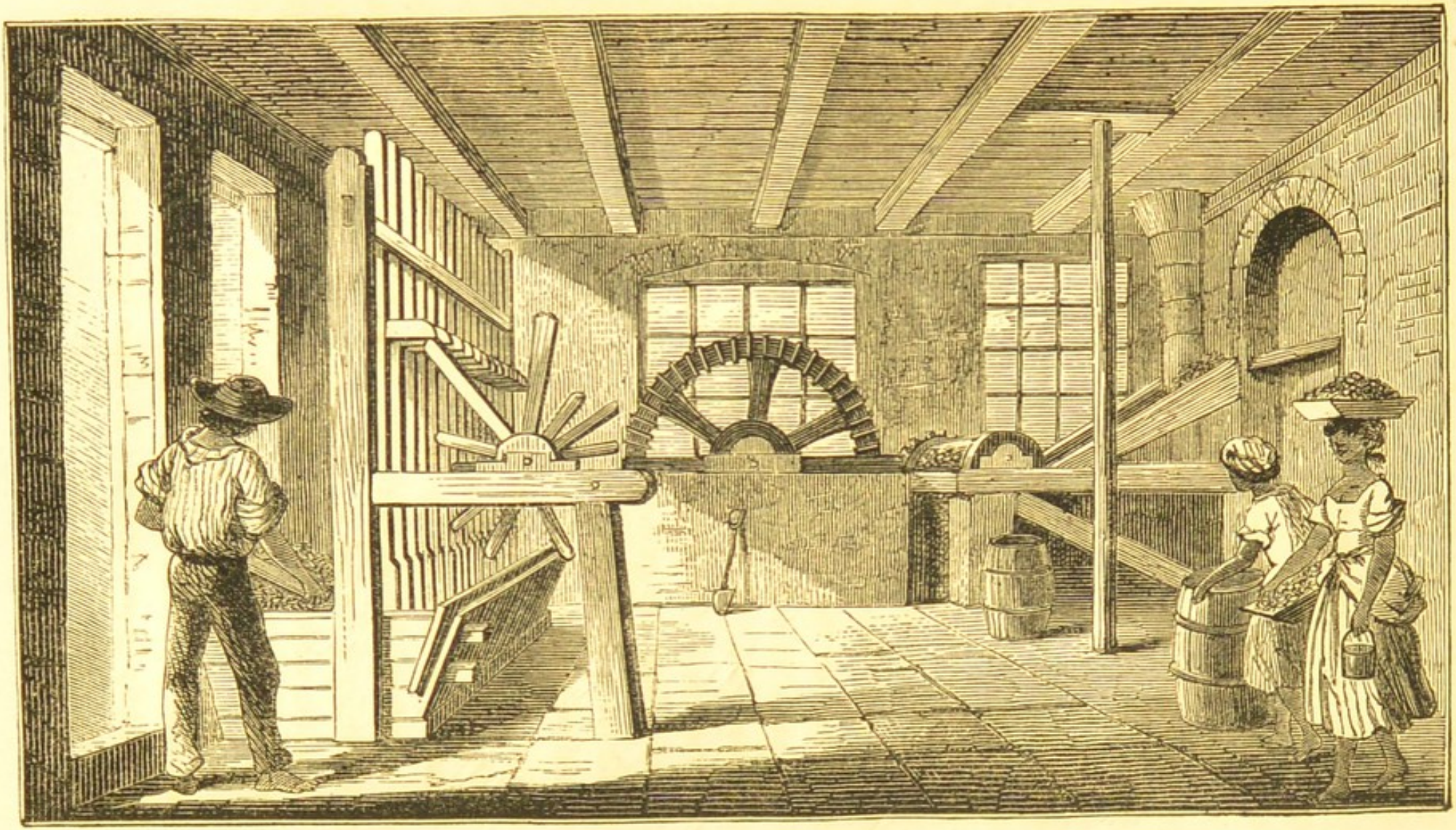


Plate 4.—Cocoa Mill in Grenada.

all upright shoots being carefully removed, so as to allow a free current of air: The buds of other branches which are not required are carefully pinched out, so that the tree shall expend the whole of its vital force upon the fruit, instead of, as gardeners call it, "making wood."

This plan having been carefully followed, a very fair crop is yielded the *fourth* year. The flowering season is from April or May to December, and the earliest blossoms begin to ripen about November or December. The fruit or pod ripens on one side first, to a pale, pinky colour. A few hours after this timely notice, it becomes semi-transparent, changing to a yellow, and is then perfectly ripe: it must be immediately gathered, as every hour deteriorates its perfection and value. Two hands generally proceed together in the work of gathering; the first picks all he can reach with his hands, while the second, provided with a long pole, either forked at the end, or with a knife inserted in it, carefully cuts off all the other pods which are ripe. These are gathered together into heaps, and allowed to lie for a day and a night. They are then cut open with a cutlass, and the seeds are taken out by hand, and at once conveyed by baskets to the works, in preparation for the next process. In some plantations the pods are at once taken to the mill for the removal of the husks. It consists of a strong frame of timber, firmly fixed to the floor, supporting a line of movable bars of wood placed perpendicularly, which, being lifted by means of arms attached to a roller, and alternately catching under a projecting pellatt in each bar, causes it to fall in the manner of a pestle upon the cacao placed in a trough below. In this state the seeds are slightly sweet, and may be eaten like other fruit. (See plate 4.)

The seeds are now covered with pulp, as we before stated, and this has to be separated from them: the process by which it is effected is called "*sweating*." Preparatory to the process, the seeds are either placed upon a sloping floor, or else in open wicker baskets, so that some part of the pulp may drain off; when this has been sufficiently done, the seeds are emptied into a close fitting box, which as soon as it is filled is closed, and the sweating allowed to go on.

This is a most delicate process, and upon a nice performance of it depends the value of the cocoa. The object to be attained by it is not only the separation of the remaining portion of the pulp, but also the production of fermentation, or a certain degree of *germination*, upon which, indeed, the active principle depends, and by which it is developed, just as the peculiar flavour and quality of malt are produced by *malting*. They are allowed to remain in the box from twenty-four to forty-eight hours, according to the season and weather, after which they are turned out in the sun, and the process of germination is checked. The colour of the seeds is produced by the action of the oxygen of the atmosphere upon the acid adhering to the skin from the process of fermentation.

The seeds are carefully spread out when taken from the box, and separated if any stick together, and on the drying platform they undergo their last process. The apartment used for this purpose is generally provided with immense shallow trays, raised a few inches from the floor on metal wheels (see plate 5). These are made to pass through apertures in the main wall, so as to be rolled out on to a platform on that side of the building most exposed to the sun, and are thus at once easily removed from the injurious effects of a

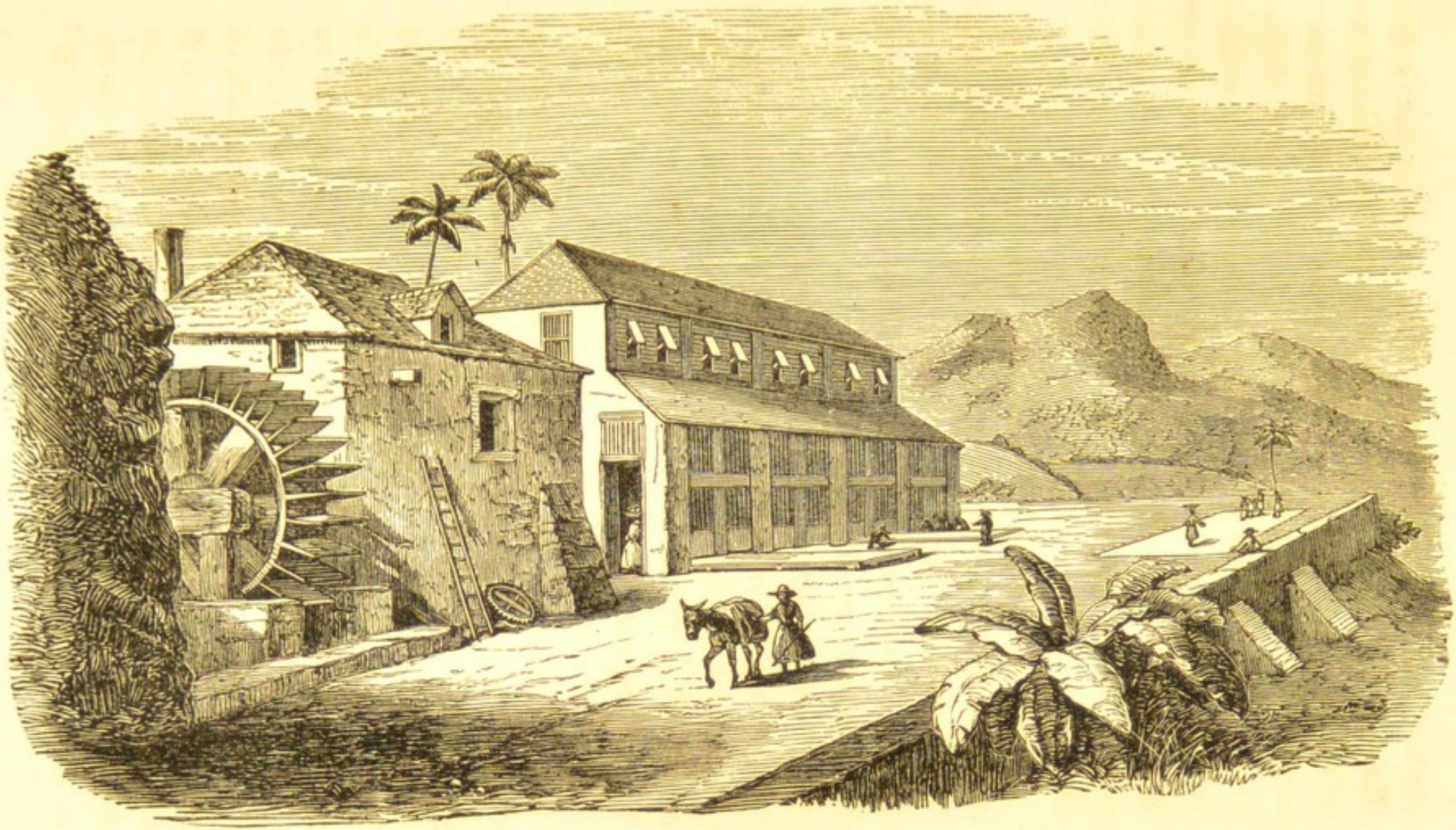


Plate 5.—A Bocan, or Cocoa-drying House in Grenada.

shower. Great care is necessary in this process, otherwise the nuts "heat," and become mildewed, and therefore unfit for use. In these trays the seeds are constantly shifted and turned, so as equally to expose them to the sun's rays, while at the same time opportunity is offered for removing any extraneous matter which may still adhere to them. They are allowed to remain in the drying-room or *bocan* until *quite dry*, when there remains nothing else to be done further than to convey them to the packing house, where they are sorted, and if so dry that the seed rattle in the shells, they are packed in barrels and bags, and are ready for shipment.

Two other crops follow in the year, which are, however, much superior in quality to the first, with which precisely the same processes are carried out; but the finer and more settled weather enables the planter to carry them out more fully, and with much greater accuracy and certainty.

SECTION V.

THE THEOBROMA CACAO AT KEW, SOUTH KENSINGTON MUSEUM, THE CRYSTAL PALACE, ETC.

It is usually interesting to be enabled to see the substances composing our food in actual growth. Unfortunately, however, we are unable to do this in the case of Cocoa. There is, indeed, a *Theobroma Cacao* at Kew, but it is a small, dwarfed, and spindly specimen, rather more than ten feet in height. Though it frequently flowers, the blossoms fall off, and of late years it has not borne fruit. It is to be found in Stove No. 15, on the right hand side, about six yards from the door, and is placed at the back. It is not at all an interesting specimen.

A case illustrative of cocoa is placed in the top floor of the New Museum, Cabinet No. 9, in which the nature of the fruit can be seen.

We have before alluded to the admirable "Food Collection" at South Kensington Museum. Under the head "Beverages," will be found a case, containing specimens of the various kinds of cacao nuts, supplied by ourselves and Messrs. Fry, of Bristol. Diagram 30, placed over the case, is a drawing of a branch of the *Theobroma Cacao;* and upon the case are preserved specimens of the pod or fruit, dissected so that the positions of the seeds may be seen and understood. At the end of the case is a part of the trunk of a small cacao tree; and a piece of the wood

of a large specimen, highly polished, so as to show the grain, hangs by the side of it. Among the preserved specimens will also be found some leaves and pods from the plants at Kew Gardens.

The various kinds of seeds, partly the result of difference in climate and soil, and partly the result of greater or less perfection in the process of curing, may here be readily seen and compared. They will be found to vary from the bright red of Grenada, to the dirty blackish grey of Nicaragua.

Side by side with these specimens is to be found the *analysis* of 1 lb. of Cocoa Nibs or Paste, or the constituent elements of which it is composed, and which is as follows :—

		oz.	grs.
1.	1 ℔ of Cocoa Nibs :—		
2.	1 ℔ of Cocoa Paste :—		
3.	Water		350
4.	Albumen and Gluten	3	85
5.	Theobromine		140
6.	Butter	8	
7.	Gum		426
8.	Starch	1	53
9.	Woody Fibre		280
10.	Colouring Matter		140
11.	Mineral Matter		280

We have also placed a case, illustrative of Cocoa, in the Crystal Palace, Sydenham. It may be found on the Ground Floor, immediately opposite the Music Hall. One, for which we have prepared some very interesting specimens, will also be found in Class III., *Food Department*, of the "Great International Exhibition, 1862." We have

placed in it natural cacao pods, which I have just received from Trinidad, with leaves and flowers; and for comparison have added crystallized samples of theobromine, theine, and caffeine—the latter a particularly fine one. To these we would also refer our readers: a careful examination will greatly assist in understanding our descriptions.

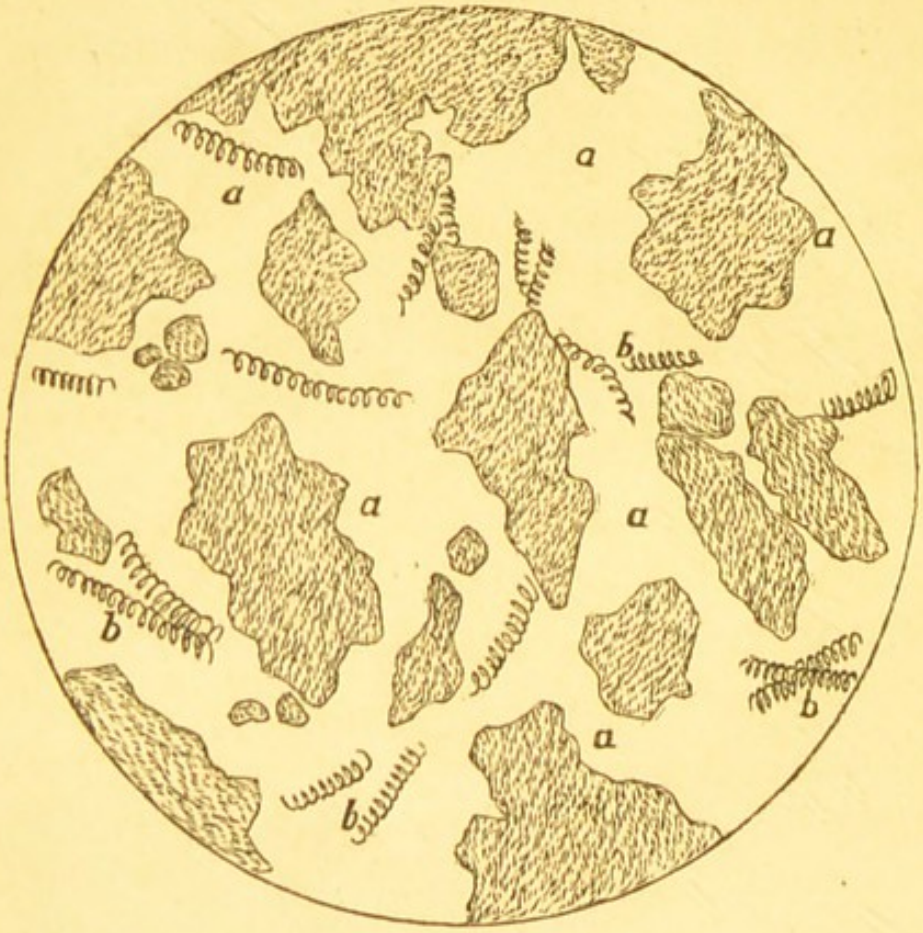
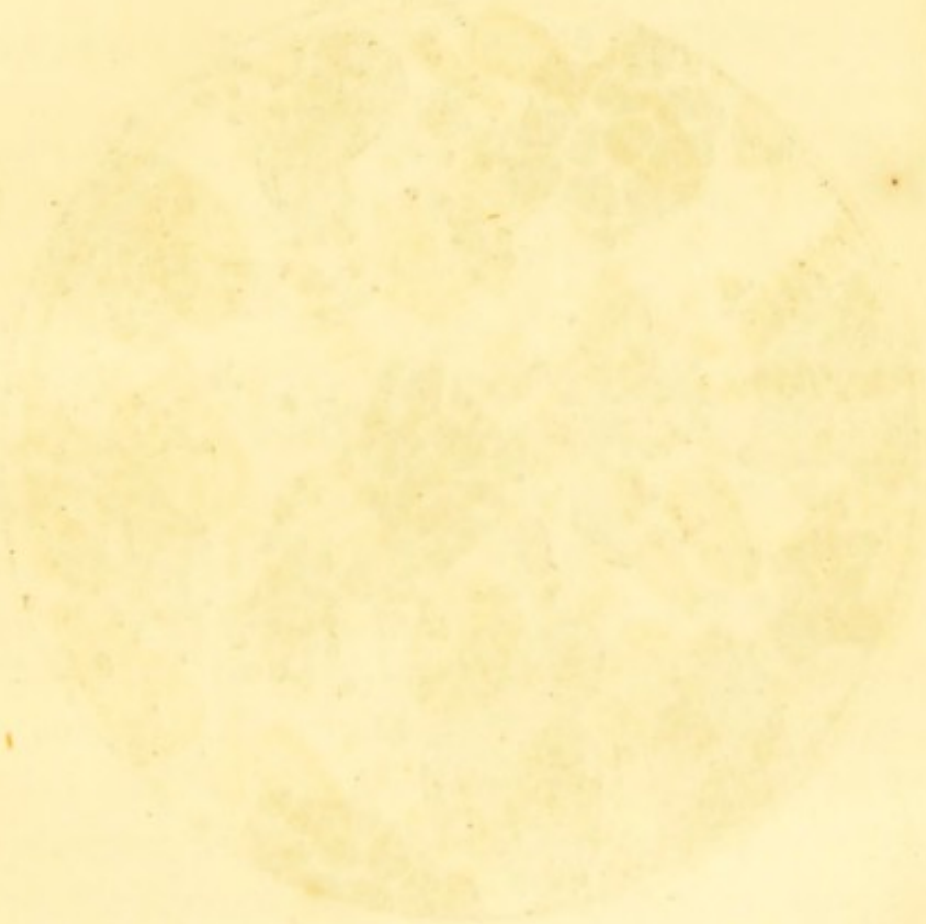


Plate 6.—Cocoa husk or shell, magnified 230 diameters.

Plate 7.—Microscopic appearance of a sample of first quality of Chocolate Powder, magnified 230 diameters. *a a a* Cells of Cocoa and their starch granules. *b b* Curcuma Arrowroot. The spiral parts are the thin membranes described p. 5.



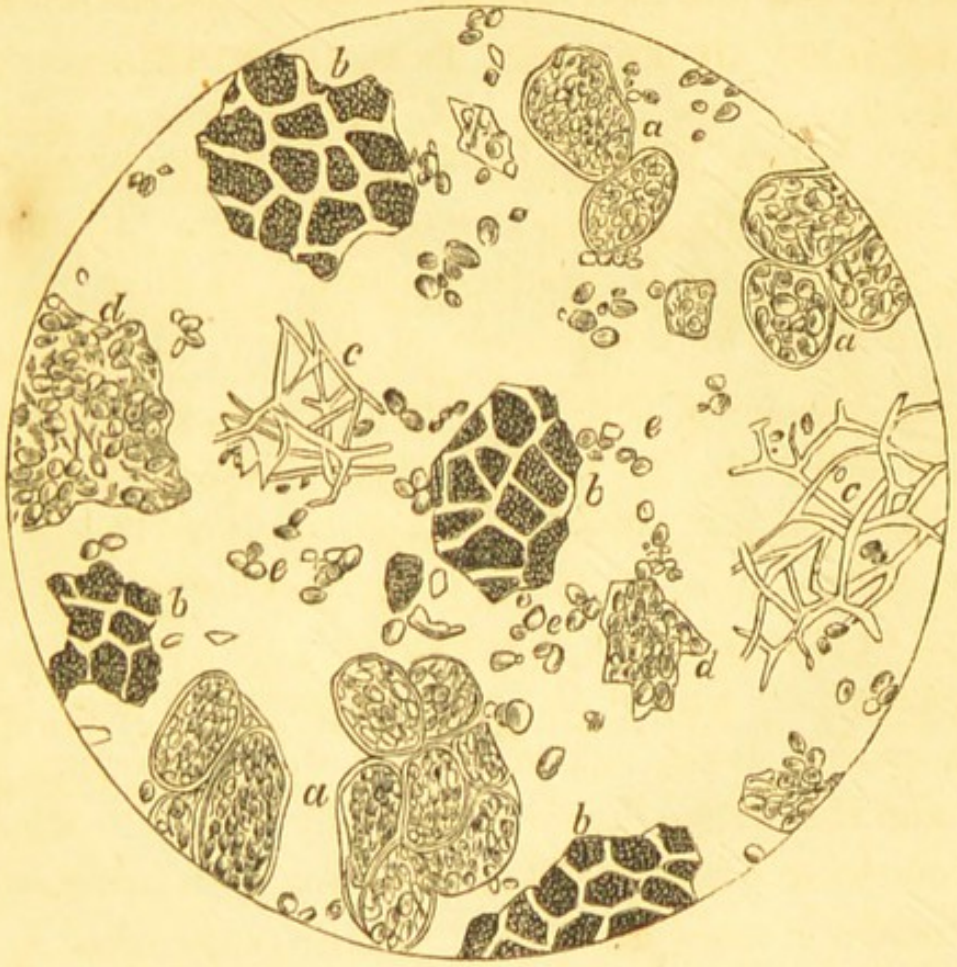


Plate 8.—Pure Cocoa, magnified 230 diameters. *a a a* Cells of the kernel of the Cocoa. *b b* Membrane of the surface of the lobes. *c c* Tissues of the embryo. *d d* Amyline. *e e* Loose corpuscles of ditto.

SECTION VI.

ON THE ACTIVE PRINCIPLES OF COCOA; OR HOW THE QUALITY OF THE NUT IS DETERMINED.

We have before intimated that one of the processes through which cocoa passes, is called *sweating*. In many respects, this process is precisely similar to that which barley undergoes in the process of *malting*, though not carried to the same extent. The change is probably effected in each case by the seed germinating. It would appear that upon this process the *theobromine* depends, or in other words, it is an effect of germination. But the possession of this principle is not the only quality required by the consumer. One of the most important things is a pleasant smooth taste, united with a due proportion of butter; and this latter is more especially requisite where the manufacturer wishes to dilute the cocoa with arrowroot, so as to render it more digestible. Astringency, also, may be present, in consequence of imperfect sweating; and this, though extremely pleasant in tea, is in a high degree objectionable in cocoa, as marring that smoothness on the palate so agreeable in cocoa.

Generally speaking, the appearance of the nuts or seeds to the experienced eye, together with the *colour*, are sufficient to indicate the quality. The colour should be a bright dark brick red; and the value depends partly on its approach to this. If the seeds are of a dull grey colour,

the sweating process was not properly conducted, or the weather was not sufficiently good for the subsequent drying, and as a consequence the value is diminished; while if yellowish grey or black, the value is still less. The seeds should be large and plump, perfectly free from worm-eaten, damaged, or mouldy nuts; and the inside kernel should be well-defined, smooth when rubbed, and the different parts, though fitting into each other, should be separated by a thin, parchment-like skin. In colour they should be of a dark chocolate brown. When these qualities are found in the nuts, it may reasonably be expected that they will turn out a good sample, and produce a high class chocolate or cocoa.

There is another active principle in cocoa, only present in minute quantity, the volatile oil, on which the aroma depends; this, however, is only developed by roasting, and is essentially different from the aroma produced by the sweating process. The exhilarating effects of cocoa are no doubt to be traced to its presence, and its operation on the nervous system.

SECTION VII.

DILUENTS AND THEIR USES: FONDNESS OF ALL NATIONS FOR WARM UNFERMENTED DRINKS.

It is not unfrequently thought that the practice of using warm unfermented drinks is merely an acquired habit, which is useless, but yet difficult to shake off. In looking at a question of diet, however, we may safely conclude that when a practice is followed universally, both by civilised and uncivilised nations, it must have some deeper ground than *mere* habit. The use would appear, in such a case, to be instinctive. Now this is just what we find with warm unfermented drinks. Our forefathers drank infusions of sage and similar herbs. A very common drink, previous to the introduction of tea and coffee, was prepared from the roots of the male orchis (*orchis mascula*), which consists principally of starch or amyline. It is said to be still used in Turkey and the East. In China and Japan the natives have drank tea from time immemorial. Coffee has probably had as long a reign in the East. In the New World we find the reign divided between cocoa and Paraguay tea in the South, and sassafras and other teas in the North. Even in the torrid zones among the Ethiopians the *chaat* is found as the indigenous, and no doubt, traditionary, warm drink of the people; while it is said that in some parts of the world this prevalent taste exerts itself, though the poor natives are unable to obtain anything better than clay

wherewith to make their "tea," which they devour in this state for the sake of the warm water, and possibly to destroy its emetic effects. However ridiculous this may seem, it certainly a short time ago had its parallel with ourselves, in the "cinder tea" administered on certain interesting occasions by certain old-fashioned dames.

It is supposed by some that one of the earliest drinks of the human family was a decoction of the sweet cane or sugar cane; it is said to have been in use in the East from time immemorial. To some such use Lucan probably refers: (Book iii., 237.)

"Quique bibunt tenerâ dulces ab arundine succos."*

The Egyptians used lentils also, boiled into a pottage, probably for the same reasons we now use tea. And the Greeks are said to have used a preparation of opium, which they called *Nepenthe*, which it seems probable they derived from Egypt. It is a singular fact that the active principle of nepenthe nearly approaches theine, caffeine, &c., in its composition.

Why, then, we may ask, should the use of warm demulcent drinks be so universal? We will endeavour to reply to the question.

The human body, for the performance of its various functions, requires a certain uniform degree of *heat*. In all climates, however widely the external temperature varies, the heat of the human body is pretty nearly the same; and it is not improbable that the slight differences which have been found may be due to accidental causes. There must be, therefore, some peculiar organism or arrangement in the human body destined to preserve this uniformity of

* "And those who drink sweet juices from the tender cane."

heat, and to prevent the abstraction of it by a low external temperature from lowering it beyond a certain point. Let us explain how this is done.

There is a class of ingredients in our food, such as starch, gum, fat, sugar, &c., which consist of three out of the four elements of which the body is composed—carbon, hydrogen, and oxygen—but from which the fourth, nitrogen, is absent. These substances, however, are of no use in building up the body, nor do they supply its waste. They are simply *fuel*, which though it may appear strange, is actually burned in the lungs, producing as much heat as if really burned in the open air in a fire. This fuel is carried from the stomach to the lungs, which are a sort of furnace, in the venous blood; and to produce the combustion man breathes the atmosphere for the sake of the oxygen which it contains, and which unites with the carbon we have spoken of to produce this internal fire. A full grown man requires on the average about 10 oz. of this carbon, or charcoal (for such it really is), in some form or other, per day; and in order to consume this food fuel, he must breathe about 3000 gallons of air, which is expired again loaded with the results of combustion—carbonic acid gas.

The quantity of food required, therefore, to supply this fuel, must depend in part upon its nature, and in part upon the temperature of the surrounding atmosphere, and its tendency to reduce the internal heat below 98°, by which the consumption of carbon is regulated. The natural taste or desire for food is so arranged as, if followed, to accomplish this end. In fact, in a state of health, the appetite is a kind of *regulator*. For instance, if we take changes of climate, as indicating changes of less magnitude in ourselves, we find that in the tropical regions the diet princi-

pally consists of such *vegetables* as do not contain more than from twenty to thirty per cent. of carbon. In the temperate zones a much higher rate is demanded, in consequence of the atmosphere being below 98°, and *animal* food is largely taken. While in the Arctic regions, fat or blubber, containing eighty per cent. of carbon, is one of the principal articles of diet; and Captain Parry states that the natives will not unfrequently consume as much as 20lbs. at a single meal. The same thing, though necessarily less in degree, occurs in our changes of season.

With this furnace for the food-fuel, may be said to be connected a hot blood apparatus. The blood sent to the extremities and cooled there, is returned by the veins to the ventricle of the heart, loaded also with fuel; it is thence pumped to the furnace or lungs, and after being heated, is poured into the auricle of the heart, and thence forced again through the system, to keep up the necessary warmth.

All liquids are taken up immediately by the lacteal vessels of the stomach, and rapidly poured into the blood; and it will be readily seen that if they are warm when so taken, they have a tendency to raise, instead of lower, the temperature of the blood, and thus to *lessen the work required of the lungs*, because *a less amount of heat is required to raise the venous to the temperature of the arterial blood.* It must be lessened, because the blood in health is never raised above a certain degree, except when, as in running, a very rapid breathing takes place, which affects it slightly. The consequence of this is, that a less amount of waste or consumption of carbon takes place, and a smaller quantity of food is required by the stomach than would otherwise be the case.

It is upon this principle, added to what we know of the composition of cocoa, and its richness in food fuel, that we account for the greater amount of warmth given by cocoa, &c., on a bleak, cold day, than is given by alcoholic liquors. And though this fact may not be universally understood, the practice, founded on the universal principle, sufficiently attests its truth.

We may just notice that the fact we have stated that all liquids pass immediately into the blood, is one of vital moment, which we would recommend our readers to bear in mind in reading the succeeding chapters.

SECTION VIII.

CHEMICAL COMPOSITION OF COCOA, AS COMPARED WITH TEA AND COFFEE—USES IN THE SYSTEM.

In treating of this part of our subject we would recommend such of our fair readers as have the opportunity to pay a visit to the South Kensington Museum, and devote a little attention to that interesting portion containing the analyses of articles of diet. A large amount of information of vast use in the family circle, may be obtained by carefully comparing the analyses which are so clearly brought out by the pound weight of each article being shown, and at its side the actual proportion of each component element. By this means the *uses* of the various articles of food may be easily recognised and understood; at the same time some highly important particulars, in an economic point of view, will be presented to the fair student.

We abstract the quantities in the following Table from the analyses of Drs. Playfair and Lankester, given in the "*Guide to the Food Collection of South Kensington Museum.*" It is intended to illustrate the value of cocoa, as an article of diet, as compared with tea and coffee, the usual warm drinks in this country.

In this and most of the following tables, the pound weight is divided into 100 parts; and the proportion of each substance to the whole is stated decimally, that is, in whole numbers appearing before the point, and in 10ths or 100ths after the point, 5·5 being equal to 5½.

Constituents of Tea, Coffee, and Cocoa.

	Tea.	Coffee.	Cocoa.
Water	5·000	12·000	5·000
Thein	3·000	...	...
Caffeine	...	1·750	...
Theobromine	...	...	2·000
Caseine, or Cheese	15·000	13·000	...
Albumen	...	...	20·000
Aromatic Oil	·750	·002	...
Gum	18·000	9·000	6·000
Sugar	3·000	6·500	...
Fat	4·000	12·000	...
Butter	...	...	50·000
Tannic Acid	26·250	...	...
Woody Fibre (insoluble) ...	20·000	35·048	4·000
Mineral Matter...	5·000	6·700	4·000
Potash, with a peculiar acid ...	...	4·000	...
Amyline, or Starch	...	...	7·000
Colouring Matter	...	...	2·000

With the above we may compare the following, which is said by Johnston* to be the average composition of the nut, when deprived of its husk.

Water	5
Starch, Gum, &c.	22
Gluten, &c.	20
Oil (cocoa butter)	51
Theobromine	2
	100

* "Chemistry of Common Life," Vol. I., p. 227.

There is, however, one other substance contained in the cocoa whose quantity has not been determined. It is the volatile oil, to which the pleasant aroma of the cocoa is due. It does not exist in the fresh seed, but is developed during the process of roasting, and exerts a powerful influence on the *nervous* system. Indeed it is probable, that though the proportion to be found is very small, the exhilarating and cheering effects of the cocoa are due in a great measure to its presence.

Speaking of the gluten of cocoa, the professor says it is "a nutritious substance, resembling the gluten of wheat or the fibrin of beef. In the tea leaf this is most abundant, in cocoa next, while coffee contains the least. It dissolves but sparingly in water, and is therefore generally lost to the consumer where only the infusion is drunk. The full benefit of this ingredient is obtained only when the tea leaves are eaten, when the coffee grounds are taken along with the infusion, or when the whole material is made into a beverage, as in the usual modes of preparing cocoa and chocolate."—Vol. I. p. 232.

Now, before we go further, it is necessary we should just call your attention to a fact, which must be known before the subjoined tables can be seen in their proper light.

The uses to which food is applicable may be added together into two. One of these is the formation of blood, flesh, bone, &c., which is effected by such substances as fibrin, albumen, gluten, &c., which are therefore called "flesh formers." The second is that of keeping up the animal heat, or supplying fuel for the combustion of oxygen in the lungs; this is accomplished by such substances as fat, butter, gum, sugar, starch, &c., and these are therefore denominated "heat givers."

In examining the foregoing table you will find that there are some insoluble and some non-nutritive substances in each; these, therefore, do not belong to either of the above classes. We therefore show these, and underneath divide the remainder, so as to enable the reader to perceive at once the action of each ingredient.

TEA :—	Water	5·000	
	Tannic acid	56·250	
	Woody fibre	20·000	
			51·250
Flesh formers	Theine	3·000	
	Caseine	15·000	
			18·000
Heat givers	Oil	·750	
	Gum	18·000	
	Sugar	3·000	
	Fat	4·000	
			25·750
	Mineral matter ..		5·000
COFFEE :—	Water	12·000	
	Woody fibre	35·048	
			47·048
Flesh formers	Caffeine	1·750	
	Caseine	13·000	
			14·750
Heat givers	Oil	·002	
	Sugar	6·500	
	Gum	9·000	
	Fat	12·000	
			27·502
	Mineral matter, acid, &c.		10·700

Cocoa :—	Water*	5·000	
	Woody fibre	4·000	
		———	9·000
Flesh formers	Theobromine.. ..	2·000	
	Albumen, fibrine, and other nitrogenous matter	20·000	
		———	22·000
Heat givers	Butter*	50·000	
	Gum	6·000	
	Starch*	7·000	
		———	63·000
Mineral and colouring matter ..			6·000

The analysis of Letellier gives the composition of the mineral matter as follows :—

Potash	33·4
Lime	11·
Magnesia	17·
Phosphoric acid	29·6
Sulphuric acid	4·5
Carbonic acid	1·
Chlorine	0·2
Silica	3·3
	100·0

* The proportions of water will vary from 5·0 to 10·0; of butter, from 50·0 to 52·0; and of starch from 7·0 to 10·0, according to the *quality* of the Cacao.

The recent analysis of Payen gives the following as the composition of cocoa :—

Butter of cacao	52
Albumen, fibrine, and other azotized matter	20
Theobromine	2
Starch	10
Cellulose	2
Colouring matter and aromatic essence ..	traces
Mineral matter	4
Water	10

The mineral matter, though not inserted either as a "flesh former" or "heat giver," is, nevertheless, nutritive, and may be added to the two classes of nutritive matters. To place the matter at one view before the reader, we add a table of results :—

		Tea.	Coffee.	Cocoa.
Nutritive matter	Flesh formers	18·000	14·750	22·000
	Heat givers	25·750	27·502	63·000
	Mineral matter	5·000	6·700	4·000
	Total	48·750	48·952	89·000
Non-nutritive matter	Woody fibre, tannic acid, water, &c.	51·250	51·048	11·000
	Total	100·000	100·000	100·000

We see, then, from this table of results, that while tea presents us with 48¾ per cent. of nourishing matter, and coffee with nearly 49 per cent., cocoa presents us with no

less than 89 per cent., or *nearly nine-tenths of its whole bulk*, of material capable of being appropriated by the digestive organs.

These analyses, however, proceed on the basis of the *raw* article. But they are not taken into the stomach in this state. It was, indeed, customary in Russia to eat the tea leaves as well as drink the infusion; and there are still stories rife of old ladies, in far-off country places, receiving a present of tea from London, and after boiling throwing away the liquor and eating the leaves. But this is not the case with us now. The Arabs also take the whole of the coffee. With us both are taken in the form of an *infusion*, being generally made by pouring boiling water upon them. On the other hand, cocoa and chocolate are entirely assimilable, or nearly so (when roasted), and *the whole bulk* is therefore taken. It would, perhaps, scarcely be correct to say they are *soluble;* because they are not really so. The apparent solution is in reality an *emulsion*, or mechanical mixture, caused by an exceedingly minute disintegration of the particles—so minute, indeed, as not to interfere with that smoothness on the palate, which is so pleasant a quality in these articles.

But from another point of view, namely, in the prepared form (the coffee and cocoa being roasted) we obtain results quite as satisfactory.

The experiments upon which the following table was formed, were conducted in order to determine the relative value of tea, coffee, and cocoa. We extract them from a work entitled, "*Cocoa, its Manufacture, &c.*," by Jas. A. Mann, Esq., F.S.S., M.R.A.S., &c., and in order that they may be more intelligible to the reader, we incorporate the results in a tabular form.

It was found that, in order to make one pint of tea, of the strength ordinarily drank (using filtered Thames water for the experiments), 83 grains, or about one-fifth of an ounce of good black tea was required; while about one ounce each (437½ grains) of coffee and cocoa were used. From the results we have to deduct 3·1 grains for mineral matter which was contained in the filtered Thames water, and which, therefore, does not belong to either the tea, coffee, or cocoa; in one pint, then, of each we have :—

	Tea.	Coffee.	Cocoa.
	grains.	grains.	grains.
Nitrogenous Substances—"Flesh-formers"	5·5	22·0	67·8
Gum, sugar, &c. } "Heat-givers"	10·0	51·6	103·2
Fat .. .. .. }	0·	1·5	223·5
Mineral Matter	6·0	14·5	15·7
	21·5	89·6	410·2
Deduct for Mineral matter contained in Water	3·1	3·1	3·1
Contents of one pint, in grains, of nutritive matter	18·4	86·5	407·1
Total matter wasted	64·6	351·	30·4
	83·0	437·5	437·5

What are the results of this table? We find that out of 83 grains of tea only 18·4, or 22 per cent. of that employed, finds its way into the system: of coffee, out of 437·5 grains employed, 86·5, or 20 per cent. is used in the body, 351

grains being wasted; while in cocoa, out of 437·5 grains, *no less than* 407·1, *or* 93 *per cent.* consists of heat-giving and flesh-forming substances, which are required by the body. A pint of cocoa, therefore, contains 2112 per cent. more *nutriment* than a pint of tea; and 370 per cent. more than a pint of coffee.

Let us, for a moment, look at these results in an *economic* point of view. The tea we may value at rather more than ½d. (⅔ of a penny); the coffee and the cocoa at one penny each. The table will then present to us the following *monetary* results:—

1⅔	pints	of tea,	value	1d.,	contain	30·7	grains	of extract.
1	,,	of coffee,	,,	1d.,	,,	86·5	,,	,,
1	,,	of cocoa,	,,	1d.,	,,	407·1	,,	,,

Cocoa therefore yields 13 times the nutriment of tea for the same value; and 4½ times as much as coffee.

To put this in another form. Bread and butter are usually eaten with tea, coffee, and cocoa. Now, supposing one pint to be allowed for breakfast, the person who takes the pint of cocoa requires 389 grains of vegetable and animal extract less than the one who takes a pint of tea; and of this no less than 223 grains is butter, which, as we have said, is requisite to keep up the heat of the body. Pretty nearly the same difference as to butter exists with coffee, *i.e.*, 222 grains; while the total difference of extract between coffee and cocoa is 321 grains. We have, therefore, to add the value of 389 grains of extract to the pint of tea, and 321 grains of extract to the pint of coffee, to render them equal, in point of nutriment, to a pint of cocoa.

Let us now turn to another ingredient in cocoa mentioned in our first table.

Theobromine is the scientific name given to the essential active principle of cocoa. It is a grey or slate crystalline substance, with a slightly bitter taste, and resembles *theine* and *caffeine*, the active principles of tea and coffee, on which their uses in part depend, in many particulars. All three differ from "heat givers" or fuel, in possessing *nitrogen*. The chemical symbol of *Theobromine* is C^7, N^2, H^4, O^2; that is to say, 7 equivalents of carbon, 2 equivalents of nitrogen, 4 equivalents of hydrogen, and 2 equivalents of oxygen. The difference between the active principles of tea, coffee, and cocoa, will be readily seen from the following table of elements or symbols :—

Theine ..	C^8	N^2	H^5	O^2	} Identical.
Caffeine ..	C^8	N^2	H^5	O^2	
Theobromine	C^7	N^2	H^4	O^2	

It appears, then, that though the effects of the three on the human frame are in some respects similar, that there is a difference which indicates, by the excess of nitrogen, that cocoa is peculiarly fitted for certain uses in the animal economy; or, that there are certain states in the body for which it is more valuable than either tea or coffee. All three are sedatives when taken to an excess, because they act primarily upon the brain. But they have also another action. We have noticed that the heat of the body is maintained to a considerable extent by the process of combustion in the lungs. If this process were carried on too rapidly, it is evident that, as the fire has to be maintained from the soft tissues of the body, the result would be the production of *atrophy*, or a gradual wasting away. Carbon,

hydrogen, and oxygen are the elements by which this combustion is maintained; and were there no retarding influence, the body would soon be reduced to a skeleton. This, however, is prevented by an element contained in the atmosphere, which serves to moderate this inward combustion, and which, practically acting as a damper, regulates, so to speak, the rate of wasting of the tissues, keeping between their consumption and reformation the balance which is necessary to the preservation of the body in a healthy state.

The element in nature by which this is effected is nitrogen; and in thus *staying* the combustion or destruction of flesh and tissue, the nitrogen of the atmosphere may be said in an *indirect* way to be "accessory" to the formation of tissue. The nitrogenous elements of food, however, not only assist in performing these uses, but at the same time are *directly* contributive to the formative process.

On turning back to the table of symbols, it will be found that cocoa possesses in its theobromine a somewhat larger amount of nitrogen than either tea or coffee. But we must also remember that in making the pint of tea we only used one-fifth of the quantity employed for making coffee and cocoa; and if we also remember that we obtain only a certain portion of the theine and caffeine by the process of infusion or decoction to which they are subjected, while we obtain the whole of the theobromine in the form of the emulsion, we shall at once see that cocoa is considerably in advance either of tea or coffee as a nitrogenous food.

It is owing to the presence of nitrogen, then, in these drinks that they have become known as *accessories;* for they practically accomplish the same purposes as flesh-

forming substances, by reducing the wear and tear of the system. This is effected by rendering a *smaller portion of food necessary* for the support of the body and the supply of its waste, than would otherwise be needed. No doubt it is owing to a practical recognition of this fact that "tea-dinners" are so popular among the poorer classes. The warm tea, by raising the temperature of the body, and the nitrogen combining at the same time to lessen the extent of combustion in the lungs, reduces the waste of the soft tissues of the body, and therefore a less supply of food is sufficient to keep it in health. The difference, therefore, in the amount of nitrogen supplied to the system by our food may be seen to form an important item in the question of the relative values of tea, coffee, and cocoa. Possibly some of our fair readers have thought that the amount spent upon tea, &c., by the poor is unnecessarily large, and that the same sum spent upon solid food would "go much further," on the ground that it is supposed more readily to assist in building up the tissues of the body. It may, however, satisfy them to know that this is altogether a mistake. It has not been found that any saving has been effected where the experiment has been tried; and this from the principle we have stated, namely, that tea, &c., supply the requisite nitrogen to the body.

"Such drinks as tea, coffee, and cocoa, all exert a remarkable influence or activity on the brain—exalting, so to speak, the nervous life; .... they soothe the vascular or corporeal system, allay hunger, retard the change of matter, and diminish the amount of bodily waste in a given time; and if this waste must, in the healthy body, be constantly restored in the form of ordinary food, this

diminution of the waste is equivalent to a lessening of the amount of food which is necessary to sustain the body—hence their value to the poor."*

But further, cocoa supplies more of *the real flesh-making elements* than either tea or coffee. The two latter supply a portion of *caseine* (the basis of cheese, which in some respects resembles *albumen*, but is inferior to it). Tea yields about $\frac{15}{100}$ of the solid matter used; but as we saw in table at p. 37, that only one-fifth of the weight is used in making a given quantity, as compared with coffee and cocoa, this sum must be reduced to one-fifth also, and will then be $\frac{3}{100}$. Coffee yields about $\frac{13}{100}$. But cocoa yields $\frac{20}{100}$ of pure vegetable albumen, or one-fifth of its entire bulk, and this reduced again to a tabular form, for the sake of clearness, is as follows:—

Tea	contains	*caseine*	3·00
Coffee	,,	*caseine*	13·00
Cocoa	,,	*albumen*	20·00

So that here, again, cocoa preponderates over its more popular rivals. For while at first sight it would appear that tea, inasmuch as it is only three times as dear as cocoa, and goes five times as far, must necessarily be a much cheaper article, we must remember that it is not the quantity of liquid alone that should guide us, but the uses to which the liquid is applicable in the animal economy. The proportionate cost of tea, coffee, and cocoa, is as three of the former to five of the two latter; but with tea and coffee we respectively, by infusion, extract *a portion* (for we cannot extract the whole by domestic utensils) *of* 3 *per cent. and* 13 *per cent. of caseine;* while, on the other

* "Chemistry of Common Life," by Professor Johnston. Vol. I., p. 233.

hand, in the emulsion of cocoa, *we obtain the full* 20 *per cent. of albumen*, the principal constituent of the serum of the blood and of the skin.

The importance of this view of the subject, confirmed, as it is, by the subjoined table, can scarcely be over-estimated, pointing, as it does, to important practical truths; to truths which affect all classes, but more especially the poor, whose necessity compels them to buy in the cheapest market. We trust that we have been enabled to show that in this point of view the use of cocoa offers them special advantages. It may, however, be mentioned in passing, that the calculations we have given are based on the prices of the best cocoas. Though not in point of fact and purity of flavour equal to them, the lower and cheaper kinds contrast even more strongly with tea and coffee in respect of economical advantages.

The constitution of muscular flesh is, according to Braconnot:—

Fleshy fibre, nerves, and vessels .. Cellular tissue converted into gelatine by cooking	18·10
Soluble albumine and fibrine	2·70
Alcoholic extract and salts	1·94
Aqueous extract and salts	0·15
Phosphates, containing albumen	0·08
Water and loss	77·03
	100·00

Cocoa may be seen, then, to possess, in its constituent character, and in high proportion, elements adapted to the

process by which flesh is formed. Indeed, the term *βρῶμα* has a reference to solid food rather than to drink, while tea and coffee are essentially liquid aliments.

In this respect, indeed, it bears a fair comparison with beef and other flesh meats, as may be seen by examining the subjoined table of the composition of blood, which is the type of flesh, and gives the composition of flesh more accurately than analyses of particular parts of the body.

	Water.	Albumen.	Fibrin.	Fat.
Beef	799·590	66·901	3·620	2·045
Veal	826·440	56·414	5·757	1·610
Pork	768·945	72·875	3·950	1·950
Mutton.....	827·765	62·705	2·970	1·161
Chicken	793·420	48·520	4·670	2·630

Here, then, we have what may be called the *positive* use of cocoa in the system, viz., that it supplies a large amount of substance fitted to restore the various forms of waste to which the human body is subject, as well as that it supplies so much carbon for the lungs. And when we bear in mind that the process of combustion is one so important as to require a renewal of the entire of the soft tissues about every nine days, we shall perceive the necessity of selecting such articles of food as shall in the fullest degree supply the wasting materials, and do this in a manner which shall call for the least possible exertion from the digestive organs, by presenting the smallest amount of useless matter. For it is worth remembering, that all extra work demanded of the digestive organs necessarily weakens and retards their operations; and that the

amount of strength which can be exerted by body and mind, is diminished to the extent that we require the stomach to perform useless work; a fact clearly showing the importance of a knowledge of the articles composing our diet.

"Of course, the general effect of these beverages [cocoa, tea, and coffee], is the combined result of the simultaneous action of all their constituent ingredients. But, possessing the two characteristic influences of retarding the change of matter, and of increasing at the same time the activity of the nervous life, they cannot, according to our present knowledge, be replaced by the strongest soups or flesh teas, or by any other infusions or decoctions which merely supply the ordinary kinds of nourishment in more or less diluted and digestible forms."*

* "Chemistry of Common Life." Vol. I., p. 234.

SECTION IX.

INCREASE OF CONSUMPTION OF COCOA.

In order to understand the table of increase below, we must remember that the consumption of any foreign article is materially affected by the rate of duty imposed upon it. Cocoa was one of the articles which suffered severely from the mistaken views of politicians. Enormous duties, with total prohibition of some kinds, for many years tended to keep the public alike in ignorance of the flavour and uses of cocoa. Thus, in 1823, the duty upon *raw* cocoa was £9 16s. per cwt., which is equal to 2s. 2¾d. per lb. on cocoa nibs; while the duty levied upon the mere husks, or shells, was £1 17s. 4d. per cwt. or 4d. per lb. From 1825 to 1838, under a "re-adjustment," foreign manufactured chocolate, which previously was prohibited, was admitted at the *trifling* duty of £24 5s. 4d. per cwt. As the duties were diminished, cocoa began to be more extensively used; for they were felt to be and were rendered still more oppressive by the fact that, in roasting, a loss of 24lbs. per cwt. takes place, which makes an important difference in the amount of duty actually paid by the *consumer*.

TABLE SHEWING THE INCREASE IN THE CONSUMPTION OF COCOA.*

	lbs.
1820	276,321
1825	347,251
1830	425,382
1835	1,084,170
1840	2,041,678
1845	2,579,497
1850	3,080,641
1855	4,383,023
1860	4,583,124
1861	5,482,023

These quantities, however, refer to *raw cocoa*, and are obtained from the amount of duty paid. A much larger quantity of cocoa is drank, owing to *dilution*, of which we shall presently treat.

* Exclusive of quantities taken for Government stores, on which no duty is paid.

SECTION X.

RELATIVE VALUE OF DIFFERENT GROWTHS.

As cocoa is an article which has to be presented in various forms, to suit the various palates of consumers, as well as to meet the wants of different classes of the community, the first attention of the manufacturer has to be directed to the object which he intends to accomplish, or the kind of cocoa he intends to produce.

If he intends to produce a chocolate of a high character, such as those intended for eating, he obtains the finest kinds of caraccas cocoa, or some analogous kind, which, while it possesses a fuller development of theobromine, has a smaller quantity of butter or fat. On the contrary, if he intends to produce an *amalgamated* or *diluted* article, he chooses one of those kinds which, by the possession of a larger amount of butter, is better suited for such purpose, and not so well adapted for consumption alone.

The following is a list of cocoas, in their order of value:—Caraccas, Surinam, Trinidad, Grenada, Jamaica, Dominica, Guayaquil, Venezuela, Bahia, Brazil, St. Lucia, &c.

Of the articles used in amalgamation we shall speak presently, under the head of "COCOA AND ITS POWERS OF COMBINATION." Suffice it now to say, that this amalgamation is rendered necessary by the fact that few persons are able to take cocoa regularly in its pure state for any length of time, in consequence of its extreme richness and

tendency to produce an increased secretion of bile; and that the amalgamated dilution must be so arranged as to accommodate the article to the palate as well as to the powers of the stomach. It is true that *solubility* is gained by the process, but this is by no means so important in a dietetical point of view as the necessity which exists for rendering it a food which can be used regularly and constantly. As we have said, with our usual diet, pure cocoa, of the ordinary kinds, cannot long be so used by the majority of persons.

It seems probable that some of the highest kinds of cocoa do not find their way into this country, but are principally consumed by the luxurious inhabitants of Spain—the price of the nuts being so high as to preclude the British manufacturer from purchasing them.

SECTION XI.

COCOA AND ITS POWERS OF COMBINATION.

In the amalgamation of cocoa, of which we have spoken, it is not the object of the manufacturer to *reduce* the fatty matter or butter which it contains, and which we have seen is so important, but to present it to the stomach in a less objectionable form. It is not altogether the *quantity* of butter it contains, but in part the *mode* of its existence; indeed, if properly manufactured, the cocoa cannot contain too much butter. We are aware that ignorant manufacturers frequently attempt to delude an equally ignorant public by advertising their cocoa as that from which "the fat has been extracted;" and it no doubt appears to them as the most simple method of obviating the difficulty, or of obtaining a business by imposing on credulity. It would be just as wise, in order to make bacon acceptable to the stomach, to *express all the fat*, and eat the cellular tissue; it is vastly wiser, by mastication, to incorporate some other substances which shall amalgamate with the fat, and thus neutralise the apparent effect—the richness—without interfering with its actual usefulness. This, in the case of cocoa, is best accomplished by an amalgamation with starch, which absorbs and unites itself with the butter of cocoa in such a manner as to be inseparable by the process of preparing for the table if properly conducted.

The abstraction of the fat, therefore, not to mention the

increased prime cost, must be open to the objection that the cocoa *would be rendered much less nutritious;* and to whatever extent the oil is expressed, the cocoa will be deteriorated to the same extent as regards its value as a food. In all those cases where premonitory symptoms of consumption point out cocoa as at once food and medicine, such a plan would render it worse than useless—*because deceptive*—the real value depending almost entirely upon the large amount of butter suspended in the emulsion; in fact, cod liver oil is recommended for precisely the same reasons, but what difference in point of flavour!

We are induced to make these remarks in order that our readers may be guarded against clap-trap advertisements whose only object is to mislead. Indeed, so necessary is a large proportion of fat to cocoa that, according to the reports of the *Lancet* Commission, one of the most common adulterations of cocoa consists in the addition of *animal fat*, to make up for the deficiency of butter caused by using inferior and damaged nuts, and grinding up with them the husks, which are almost destitute of it.

Of the class of substances with which cocoa most readily combines, the richest are sugar and starch. The latter is found very largely in the vegetable kingdom, and is of an irregularly-shaped, generally ovoid, globular form, varying from 1-400th to 1-2,000th of an inch in diameter. It is insoluble in water, but very diffusible. The globules vary in shape according to the source whence they are derived. We have added a plate representing some of the different shapes of arrowroot and other starches, which can thus be readily compared with each other. Some kinds are used only for adulteration.

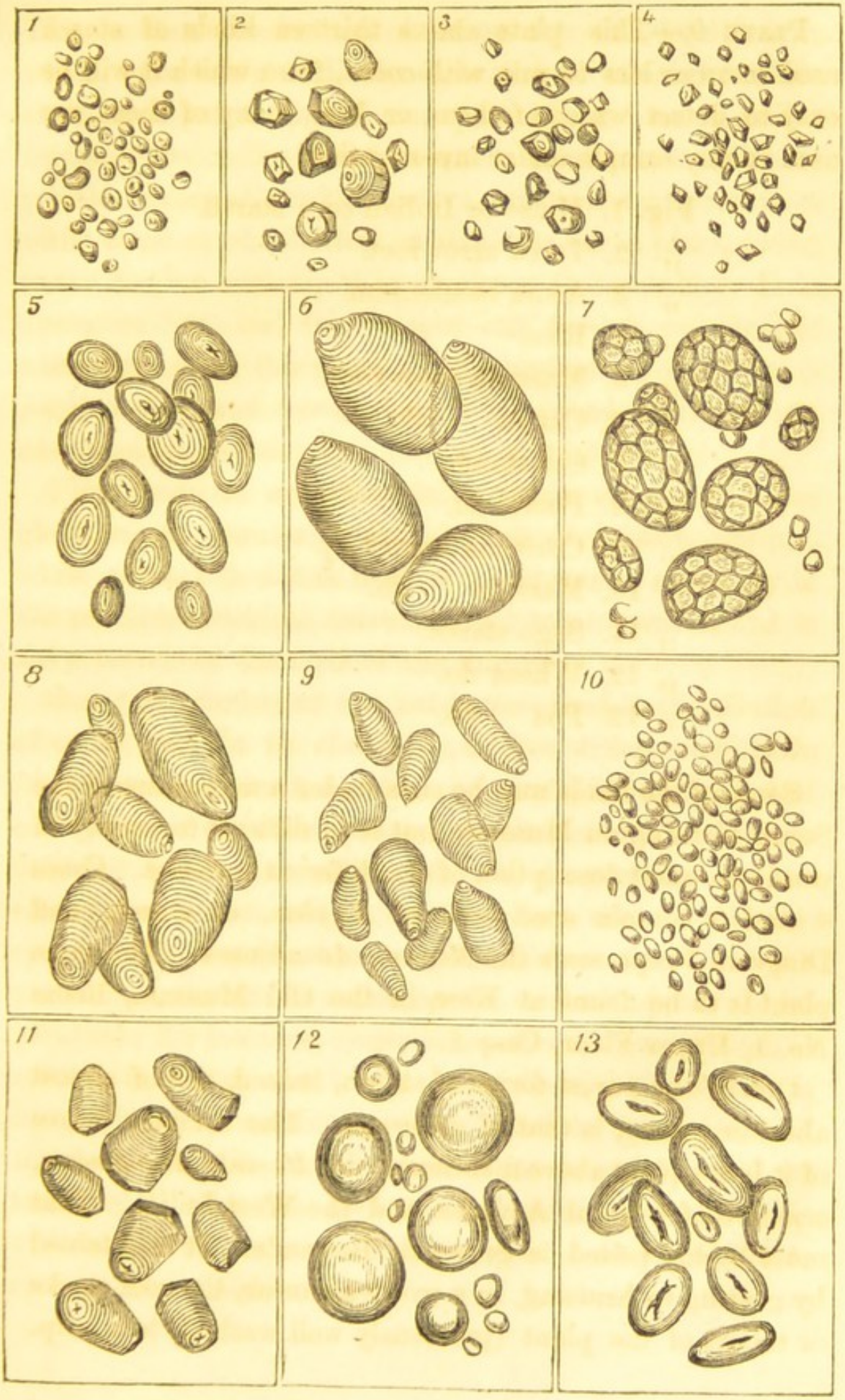
PLATE 9.—This plate shews thirteen kinds of starch used more or less to mix with cocoa, from which it will be easy to detect which of them, or how many of them, are used in any sample under investigation.

Fig. 1. Maize or Indian corn starch.
„ 2. Tacca arrowroot.
„ 3. Arum esculentum.
„ 4. Rice.
„ 5. Maranta arrowroot.
„ 6. Canna do.
„ 7. Oat starch.
„ 8. Potato do.
„ 9. Curcuma arrowroot.
„ 10. Maranta do.
„ 11. Sago starch.
„ 12. Wheat do.
„ 13. Pea do.

Some of the kinds may be seen under a microscope at the South Kensington Museum, but it is difficult to convey in words an exact description of the different varieties. Cases 4 and 5 contain specimens of *Amylum*, or starch, and Diagram 7 represents the *Maranta Arundinacea*. The same plant is to be found at Kew, in the Old Museum, Room No. 1, Upper Floor, Case 5.

One of the purest forms of starch, indeed, one of almost absolute purity, is that of *arrowroot*. The common source of it is the plant above mentioned, the *Maranta Arundinacea*, a native of tropical America and the West Indies. That most highly prized is grown in Bermuda. It is obtained by grating or bruising, in a wooden mortar, the root stocks or tubers of the plant (previously well washed) to a pulp.

Plate 9.



This is then thrown into a large tub of clean water, which, after being well stirred, is passed through a hair sieve, to separate the fibrous part of the root from the fecula. The milky water in which the fecula is still suspended is then allowed to remain until it is deposited in a white mass at the bottom, which soon takes place, owing to the fact we noticed, that *arrowroot* is insoluble. It is again washed, and the process still further repeated, if necessary, until the mass at the bottom of the tub is *perfectly white* and pure, when it is spread out in the sun and dried on sheets.

Pure maranta arrowroot is ovoid in shape, and the globules are regular in size, and is of a dull, opaque, white colour; it differs from common starch, especially in the peculiar crackling noise emitted when pressed, and in the retention of the form of the fingers.

Sugar is another of the substances used in the dilution of cocoa, and in its chemical qualities differs very little from starch. Indeed, amylum, or starch, in the process of absorption or digestion, passes into *glucose*, a form of sugar differing from cane sugar in the proportions of the elements of water, and it is in this form taken up by the system. Cane sugar, however, differs from starch in some particulars, though its action on the stomach appears to be identical; for instance, sugar is capable of fermentation, is soluble in water, and has a sweet taste, while fecula is incapable of fermentation, only diffusible in water, and tasteless. But, in consequence of its sweetness, and its tendency to cloy the appetite and produce thirst, it is evident that only a very small quantity could be added to cocoa. The article itself is so well known as to need no

description. The following is the chemical formula of sugars of different kinds :—

Sugar of Milk	C^{24}, O^{24}, H^{24}.
Glucose	C^{12}, O^{14} H^{14}.
Uncrystallizable Sugar ..	C^{12}, O^{12}, H^{12}.
Cane Sugar	C^{12}, O^{11}, H^{11}.
Caramel	C^{12}, O^{9}, H^{9}.

Amylum and sugar, therefore, belong to that class of articles of food which are known as *carbonaceous*, or "heat givers," and are applicable to precisely the same purpose as fat, viz., to supply fuel for combustion in the lungs. In the addition of such substances to cocoa, therefore, no *adulteration* takes place, the addition not being made for the purpose of deceiving the public, but for the purpose of rendering the article more perfectly adapted to the wants and taste of the consumer; for cocoa not only readily combines with the fecula of the arrowroot and the sugar, but these articles are of such a nature that they fully preserve its power as a "heat giver," while they render it more acceptable to the palate. The amalgamation, however, to be effectual, must take place at a certain process in the manufacture; unlike chicory and coffee, which may be ground separately and mixed by the consumer, it would be impossible for him to mix arrowroot with cocoa, either in preparation for table, or otherwise. They require to be ground together in a heated state, nor do they unite or amalgamate on any other conditions. Hence, the charge of adulteration cannot apply to these manufactured combinations of cocoa.

SECTION XII.

ICELAND MOSS COCOA.

We come now to a new form or combination of cocoa, upon the perfection of which we spent some years of labour, and of which *we were the inventors* and originators.

The substance usually known as "Iceland Moss" is no doubt familiar to our fair readers. Our chief supply is derived from Iceland and Norway. It is also a native, however, of the mountainous regions of Scotland. Notwithstanding the intense cold of the former countries, the moss obtains there a very large size, while in Scotland it is comparatively small. It is of a very nutritive nature, and it is asserted that soup made of it contains twice the amount of nutriment that is contained in that thickened with flour. It is known by several names, among which are *Lichen Islandicus*, *Cetraria Islandica*, *Cladonia rangiferina*, and *Cenomyce rangeferina*. The latter variety grows in vast abundance, and is the principal food of the reindeer. Another variety, *Gyrophora*, forms a part of the food supplied by nature to the Canadian hunter, by whom it is known as *Tripe de Roche*. The kind which we use in the manufacture of our Iceland Moss Cocoa, is the *Lichen Islandicus*, or Iceland Moss proper. When dry it is nearly inodorous, but with a bitter and rather unpleasant taste, and is of a straw colour; the flower is a whitish grey.

Throughout Norway, Lapland, and Iceland, in the latter

country especially, the inhabitants very extensively use the Iceland Moss as an article of aliment, and they are said to regard it as "the gift of a bountiful Providence, which sends them bread out of the very stones." Dr. Henderson says that porridge made of it is the most wholesome and most palatable article of Icelandic diet. It is first freed from its bitter matter, and after being dried and powdered, it is made into a kind of cake, or is boiled in reindeer milk. It is necessary to free it of the bitter extract, or *cetrarin*, before use, as otherwise it would act as a purgative; indeed, from the presence of this principle, it has sometimes been called *Lichen Catharticus*.

The peculiar advantages to be derived from the use of Iceland Moss, especially in cases where pulmonary affections exist, have been long known to the medical world. Its use is not only derived from its composition, but from the ease and readiness with which it is convertible into tissue. We have great pleasure in being able to insert the following testimonial as to its peculiar adaptation when combined with cocoa:—

"I have carefully examined, both microscopically and chemically, the preparation of ICELAND MOSS AND COCOA, made by Messrs. Dunn and Hewett. I find it to be carefully manufactured with ingredients of the first quality.

"The combination of ICELAND MOSS AND COCOA forms a very valuable article of diet, suited equally for the robust and for invalids, especially those whose digestion is impaired. It is very nutritious, of easy digestibility, and it possesses, moreover, tonic properties.

"ARTHUR HILL HASSALL, M.D.,

"Analyst of the Lancet Sanitary Commission, Author of 'Food and its Adulterations,' 'Adulterations Detected,' &c., &c."

The following is the analysis of Iceland Moss, given by the celebrated Berzelius :—

Starchy matter of a peculiar kind, *lichenine*	44·6
Bitter principle, *cetrarin*	3·0
Uncrystallized sugar	3·6
Chlorophylle	1·6
Extractive matter	7·0
Gum	3·7
Bi-lichenites of potass and lime, and phosphate of lime	1·9
Amylaceous fibrine	36·2

In the process of manufacture the first thing is to remove the *cetrarin*, or bitter principle, which we do, after perfectly cleaning the moss, by a peculiar process. The two most important elements which remain are the *lichenine* and the *fibrine*. These can be with the best results added to cocoa. The first, lichenine, differs in many respects from arrow-root starch, inasmuch as it is partly soluble in cold water, and in its composition consists of equal equivalents of oxygen, hydrogen, and carbon. The *chlorophylle* appears to be simply the colouring matter of the plant. The fibrine, is, however, a much more important element, being the nitrogenous or flesh making portion of the food, the importance of which we have seen in the chapter on DILUENTS AND THEIR USES.

A judicious use of such a material in combination with cocoa, enables us to present, especially to invalids, an article of diet peculiarly valuable, in which the original qualities of the cocoa are considerably enhanced.

The increasing popularity which our Iceland Moss Cocoa has met with, has induced other makers to issue a spurious

article. We have, therefore, endeavoured to secure the public, by adopting as our trade-mark a chocolate girl, (see plate 10), which is placed upon every packet.

One of the samples we tried we found to be composed not of Iceland moss, but of *Irish moss* (Garragene or Carrageen), the *Chrondus Crispus*, a plant belonging to the class *Algæ*. It is considerably darker in colour than Iceland moss, and contains more of the bitter principle. The Iceland Moss Cocoa is *perfectly free from bitter*, and when made is of a light colour, while that we tested was decidedly bitter, and of a very dark colour. We are induced to make these remarks in self-defence, and as a warning to the public not to purchase a spurious article.

SECTION XIII.

MILK AND COCOA.

One of the forms in which cocoa is offered to the public, is a mixture of cocoa and milk. Milk, as forming the earlier food of the human family, as well as of the class of animals called *mammals*, may be regarded as *the type of food.* As, however, the form in which it is met with by the adult is that of cow's milk, it will be sufficient for our purpose to consider that alone on the present occasion, and it will be useful to do so on account of the advantages which may be derived from its mixture with cocoa and chocolate.

In a previous chapter we saw that the large amount of fat, as compared with *nitrogenous* substances, was the reason why cocoa could not be taken in its pure state for any lengthened time without disagreeing with the stomach and producing *biliousness.* This unpleasant condition is the result of the presence of a larger quantity of fat in the system than is required for combustion in the lungs, for this, we saw, was the only use made of fat.

Referring again to the Catalogue of the Food Department of the South Kensington Museum, we find the following analysis of cow's milk, prepared by Dr. Lankester.

In 1lb. of milk :—		oz.	grs.
Water		13	333
Caseine "flesh former"			350
Butter	"heat givers"		245
Sugar, or *lactose* ..			315
Mineral matter			70

According to MM. Henrie and Chevalier, the composition is as follows.—

Caseine	4·48
Butter	3·13
Sugar of Milk	4·77
Salts, various	0·60
Water	87·02
	100·00

By comparing these with the analysis of cocoa we have already given, it will be found that in milk we have a much *smaller proportion of fat*, being only about $\frac{1}{32}$nd of its bulk or weight, while in cocoa it constitutes $\frac{1}{2}$; on the other hand, we have a *much larger proportion of nitrogenous matter*, nitrogen forming upwards of 15 per cent. of caseine. Sugar, especially in the form of *lactose*, possesses also peculiar advantages.

By remembering also that persons may be supported for an indefinite time upon milk, we may conclude that it contains all the elements necessary for the growth and sustenance of the human body, and we shall at once see how valuable an auxiliary it is.

According to Professor Johnston, cocoa and milk not only nearly approach each other, but the excessive constituents of each seem admirably adapted to dovetail into each other—"a skilful chemical adjustment, made without chemical knowledge, as the result of long and wide experience."*

By the addition of milk to chocolate or cocoa, therefore,

* "Chemistry of Common Life." Vol. I., p. 229.

whether previously to preparation for table or at table, its nutritive qualities are very greatly increased; the nitrogen of the caseine in the milk uniting with and modifying the proportion of fat which they contain, rendering the whole better suited to the taste and to the requirements of the stomach. In thus uniting them, we do but follow the instinctive habits of nature, which lead us to combine our food so as to produce the requisite proportions of nitrogenous and carbonaceous matters presented to the digestive organs. For example, it is most agreeable to combine food rich in nitrogen with that which is rich in carbon: we take eggs with bacon, peas pudding with boiled pork, butter with bread, fat bacon with veal; and a very little attention to the science of food will serve to show us why "they agree best with us" in such forms. It simply is that the union tends to preserve the due equilibrium, and provides a proper relative supply of carbon and nitrogen.

Milk, however, can only be used in small quantities; if too much be used the "sugar of milk" or *lactose* is converted into *lactic acid*, and it curdles in the stomach from the union with saliva. It needs care that the quantity be not too great.

The preparation of milk and cocoa is intended to supply the want of milk frequently experienced in sea voyages; as also to provide against any accidental difficulty in obtaining it in a pure state.

SECTION XIV.

UPON WHAT, THEN, DOES THE VALUE OF COCOA, AS AN ARTICLE OF DIET, DEPEND?

We introduce this chapter to give us an opportunity of presenting a *resumè* of what we have already said. We may, perhaps, be enabled to perceive that the value of cocoa or chocolate depends upon the fact that it presents to the stomach, in an almost pure form, all the elements required for the growth and sustenance of the body; namely, material for the restoration of its worn-out tissues, and fuel for the maintenance of its heat.

We have seen that no warm drink that we take at all approaches cocoa in its nutritive character, because it is at once food and drink, performing all the uses of warm drinks, yet at the same time presenting to the stomach a very considerable quantity of nitrogenous and carbonaceous matter; and that this advantage is due in part to the fact of its being taken in the form of an emulsion, instead of an infusion or decoction.

Another advantage we have endeavoured to bring out is, that these elements are presented to the stomach in a form calling for comparatively little exertion on its part, being easily digested, or, in fact, taken up at once by the lacteal vessels of the stomach; and that, as a consequence, cocoa and chocolate call for *less work* from that organ, and, in the same proportion, reduce the wear and tear of the system.

The combustion in the lungs, and the destruction of soft tissue, must go on while life continues, *no matter at what cost;* death follows a reduction of the temperature of the blood. And hence, in sickness, when placed upon low diet, and almost incapable of eating, a very rapid loss of flesh takes place, the great bulk of which, except in cases of profuse perspiration, is burnt up in the lungs. In such cases cocoa, in one of its forms, is a very valuable article of diet, not only because it slightly raises the temperature of the blood, but also because it supplies at once, in its butter, a very large quantity of fuel, which can be at once conveyed to the lungs, and thus lessen the destruction of the soft tissues of the body.

SECTION XV.

COCOA AS A RAW AND AS A MANUFACTURED ARTICLE.

Cocoa and chocolate are presented to the public as *manufactured* articles, and the process of manufacture is one which is designed to prepare the article for consumption. In its raw state, the cacao nut is perfectly useless to the public. It requires to go through several processes, which, though they are not very difficult to comprehend, are yet tedious in themselves. We purpose, then, to present to our fair readers a very brief account of the processes through which cocoa passes before it comes under their notice.

The value or importance of perfection in such process is self-evident, for upon it depends, to a great extent, the perfection of the article. In the home circle, our fair readers will readily testify to the same truth, well knowing that the deliciousness of a joint of meat depends quite as much upon "being done to a turn" as upon the quality of the meat itself. To this must be added, when carried on upon a large scale, the peculiar adaptation of machinery to perform and perfect certain portions of the process: much of the perfection in the quality of the cocoa depends upon the skill by which mechanical appliances are brought to bear upon it.

We have before intimated that the first element in success is the *judgment of the manufacturer* in selecting such

kinds or varieties of cacao nuts as shall best accomplish his purposes, or produce such an article as shall meet the wants of the consumer. To do this, he must discover the relative quantities of carbonaceous and nitrogenous elements in the sample, and decide as to how far it will bear dilution, consistent with a maintenance of its distinctive character. The processes by which this is effected are too tedious to detail, and form a part of quantitative chemistry, which it is unnecessary to discuss here.

The first process, after the selection of the cocoa to be used, is to very carefully pick out and separate every mouldy, worm-eaten, or defective nut, which may, however, excepting such as would destroy the flavour, be used in the manufacture of cheaper kinds. This is done by hand, and an opportunity is thus offered for removing all extraneous matter, so that the nuts shall be perfectly clean: they are then ready for *Roasting*.

This process is effected in a metal cylinder, with holes at each end, through which the vapour generated in the process is allowed to escape. This is placed over a slow fire, and carefully and gently made to revolve, so as to communicate a uniform degree of heat to the contents. By means of pieces of iron, attached in a spiral direction to the inside of the cylinder, the relative position of the nuts is varied every distinct revolution, so that each in turn approaches the side and becomes heated. This is continued for some time, until the aroma is sufficiently developed, when the nut will have become brittle, and the husks will, to a certain extent, be broken off and freed from the *nib*.

The nuts are then removed from the cylinder, and are placed upon an open wire-work cooler, where they are allowed to remain until perfectly cold. They are then

passed on to a machine called a "kibling mill," where they are just so far bruised as to separate the parts of the nut or seed described on p. 5, and to free the nibs from the parchment-like skin which in the whole seed divides them. The whole of the husks or skins are then removed by sifting, and by *a fan* or some other method of winnowing. We have now the pure cocoa nib ready for sale.

Should *flake cocoa* be required, which is an article, like the nibs, taking a long time in preparation, the nibs are taken on to a mill, consisting of two cones working one inside the other, through which the nibs alone are passed. Pure flake cocoa *is not a diluted or amalgamated article.*

If chocolate or soluble cocoa be required, the nibs are passed into a mill, consisting of stone or metal rollers, which are usually heated either by charcoal fires or by steam, so as to warm or melt the fat. Between these rollers the nibs are passed and crushed until perfectly smooth, and then, in consequence of the melting of the fat, they pass from the rollers as a warm paste. The next stage is the one where the substances used in amalgamation are incorporated. In chocolate, sugar and vanilla, or any other substance whose flavour may be desired, are the only articles added: in cocoa, sugar and the arrowroot only are added by respectable makers, in order, as we said p. 10, to produce a powder. That prepared expressly for homœopathic practice, however, is entirely free from any flavouring matters. These, together, with the heated paste, are placed in a close box, where they are worked together by revolving wheels until fully and perfectly incorporated. The chocolate is taken from the box, and formed into

different shapes in moulds, and dried, while the powder is at once ready for sale.

The different kinds of cocoa may necessitate some slight deviation from the above plan, but it contains the course generally adopted.

SECTION XVI.

CHOCOLATE AND GRANULATED COCOA.

Chocolate is frequently flavoured with vanilla. The Spaniards found the Mexicans used it for this purpose, and it has been used for the same purpose ever since. It is the produce of a plant called *Vanilla Aromatica;* it grows in South America, and belongs to the natural family *Orchidaceæ.* The high price, however, prevents its use, except in the best kinds of chocolate.

Granulated cocoa is an article somewhat similar in appearance to soluble cocoa, and is not unfrequently advertised as "perfectly *pure* cocoa," "*unadulterated* cocoa," &c. If by this the consumer thinks he obtains cocoa, or cacao nuts simply ground, he is under a delusion. It is *impossible* to reduce the cocoa nibs to a powder without the admixture of some other substance. The granulation is produced by the addition of such a quantity of sugar and farina as shall serve to disintegrate the cocoa, each particle of cocoa being, in reality, coated with an extremely fine film of sugar and starch, by which it is kept from again forming a pasty mass.

SECTION XVII.

HOW ARE COCOA AND CHOCOLATE RENDERED SOLUBLE?

In certain forms cocoa is *insoluble in boiling water*, that is to say, it forms a pasty mass, which cannot be separated or disintegrated by it. It is necessary to avoid this. To some extent solubility is effected by the fatty part being heated or melted by the boiling water; but unless this be done in a certain manner, that state rapidly passes away, and the albumen coagulates like the white of an egg. Cocoa nibs and flaked cocoas require a long continuance of heat, which must not, however, reach the boiling point, 212°. But if the water which is first poured upon them be not boiling when taken from the fire, more or less of the cocoa remains insoluble, and to make this class, simmering is absolutely necessary.

Chocolate and cocoa do not require a long continued application of heat, for, being ground with substances like arrowroot and sugar, reduced to a very fine powder, and readily soluble or diffusible in water, the particles of cocoa are readily liberated from each other, and being of very little greater specific gravity than water, are easily kept suspended in it by stirring. If, however, the particles be allowed to precipitate themselves, or if the cocoa be allowed to stand until the water becomes nearly clear, the substance which settles at the bottom of the cup cannot

again be suspended, and is commonly said to be insoluble. In truth, cocoa always is insoluble; the solubility is really a minute division of its particles. The method of suspension is most clearly seen in chocolate, which, not having so large a quantity of diffusible substance in it as cocoa, requires "beating" or "frothing" to render it fit for the table. The solubility depends, then, upon the mixture of other substances with the cocoa nuts, which being either soluble or easily diffusible in water, serve to separate the particles of the nut from each other.

SECTION XVIII.

COCOA SHELLS OR HUSKS.

One very important part of the manufacture of cocoa is *the entire removal of the shell or husk* which surrounds the bean. It is very thin and light, but is composed of insoluble woody fibre, of a nature calculated to be highly irritating to the stomach and digestive organs. It is, of course, possible to avoid the expense and trouble of separating these husks, by grinding them up with the nut at once; but such a course can only be taken by those who are ignorant of the consequences, or by those unprincipled makers who care only for their profits.

Dr. Ure, in his "Dictionary of *Arts, Manufactures, and Mines*," relates a case shewing the injurious effects which result from the presence of the shells in the cocoa. Some years ago the cocoa for the Navy was prepared at the Royal Victualling Yard, Deptford, and they exercised the usual amount of forethought and wisdom which belong to Red-tapeism. The manufacture being entrusted to individuals who were ignorant of the nature of the nut, they ground up the *whole nut* without shelling it, and issued the cocoa in that form to the Navy. However, ill effects soon followed, which were traced directly to the "Government cocoa;" the men who partook of it being affected with sickness, vomiting, and purging; in fact, with symptoms clearly showing that something most injurious had been taken.

The result of an examination of the cocoa revealed the fact that the irritation of the stomach and intestines, which was so violent as to disable the men, was traceable to the circumstance that the husks had been ignorantly ground up with the cocoa.

Whether, then, we intend to use the cocoa as an article of diet, or as a remedial agent, it is of the utmost consequence that we get rid of these husks, and leave the nibs perfectly free. This is very carefully done in our manufactory by a most ingenious machine.

The husks are used very extensively in Ireland, and, being sold at about 3d. per lb., form one of the chief drinks of the poorest classes, but are not to any extent used in this country. The consumption in 1859 amounted to 1,137,584 lb., of which 981,792 lb. were imported. It is probable the use of the husks in Ireland did not arise at first from the poverty of the people, but from the fact that while their admission into Great Britain was strictly prohibited, they were permitted to be imported into Ireland at a merely nominal duty. At present they pay 2s. per cwt. from foreign ports, while cocoa nuts pay 9s. 4d. per cwt., with a slight additional per centage.

SECTION XIX.

COCOA AS A REMEDIAL AGENT—HOMŒOPATHIC AND DIETETIC DIETS.

We have treated principally in the foregoing pages of cocoa as *an article of diet;* a few words may be said of it as a remedial agent.

For many years we have been engaged largely in the manufacture of a soluble cocoa, generally known as Homœopathic Cocoa, originally introduced and manufactured by my partner, D. DUNN. The success and the increasing confidence which this article has met are proofs of its adaptation to certain ends, and that that adaptation is appreciated by the public. It is an article specially fitted for the invalid and the homœopathic patient, and is very carefully made from ingredients we think particularly suited for such uses.

We find that in the sick room, and to some extent with convalescents, there is a great loss of appetite, the result, in part, of a loss of muscular exercise. In this state, of course, the system does not receive, and indeed cannot take, its accustomed supply of nutritive matter, and as a consequence the lungs are inadequately supplied with carbon. This deficit is made up from the fleshy parts of the body itself, which, therefore, soon begins to waste or become thin. To avoid this, with the consequent loss of strength, is a great desideratum, because of the great difficulty of restoring it

to its previous condition; and this can only be done by supplying food which, while sufficiently agreeable to commend itself to the imperfect appetite, shall, as far as practicable, counteract the tendency to such waste. And even with the convalescent, whose appetite slowly improves, though under the influence of tonics, the restoration to perfect health is, to a certain extent, retarded by the inadequate supply of nitrogenous and carbonaceous matters which he is able to take.

Cocoa, especially in the form in which its butter is diluted or amalgamated, is admirably suited to such a state of the system. For, besides containing nitrogen in combination with the albumen (the most valuable flesh-making substance), it offers a good supply of fat in a pleasant form, which, together with the sugar and amyline, form the food necessary for the lungs. As supplying "heat-givers" and "flesh-makers" in so agreeable a form, we believe the best Soluble Cocoa, Chocolate Powder, or Homœopathic Cocoa, to be a most powerful remedial agent, and a valuable auxiliary in the hands of the surgeon. We know of no form in which cocoa could be rendered more acceptable in the sick room, unless it be that in combination with pure *Iceland* moss.

Other and cheaper kinds of cocoa are prepared, and often recommended to the public; but as we have already shewn the cost of good cocoa, we leave it to our readers to decide whether it can be used in them. The only method would be the larger dilution with the lowest kinds of arrowroot (such as that generally known as potato starch), in which case the relative proportions of nitrogen and carbon are destroyed. Inferior qualities of cocoa are also used,—the quality of which is mainly owing to imperfect

growth, to want of care in cultivation, or to bad curing, —by all of which the theobromine is injured. Much of the cocoa also is damaged in the transit, and this of necessity is unfit for food, and specially unfit for a state in which the stomach is particularly delicate and most easily affected.

The value of cocoa as a remedial agent can only be tested, therefore, by using those kinds, upon the manufacture of which the greatest care has been expended, and where the finest kinds of nut are used. Every heated or damaged seed left before roasting, tends to vitiate and destroy the desired purity, and to render the article useless in this point of view, though, perhaps, still available for a commoner and cheaper quality. Indeed, it is only by thus separating or picking the cocoa, that a high class article can be obtained; nor is it easy to conceive any method by which a manufacturer shall produce only *first-class goods*.

It is not necessary to suppose that any other articles deleterious in themselves are used. Should their presence be suspected the means of discovery are appended, and to these the reader is referred.

SECTION XX.

FOOD AND ITS ADULTERATIONS.

The extent to which articles of food have been adulterated, and the number of injurious ingredients which have of late been added, in order to increase the profits either of manufacturer or dealer has so much increased, that it was found necessary last year to pass an Act of Parliament to protect the public. The manufacturer is not, however, to be considered as the only guilty party; the dealer and consumer both share it with him. The latter, by constantly searching for "bargains," and thinking he can purchase at some shops best articles at the price of common ones, offers very great inducements to the shopkeeper to keep *only* lower qualities, for which, however, he not unfrequently obtains the prices of best. A remedy for this kind of fraud is to be found in the practice of buying only such articles, if liable to dilution, as are marked with the manufacturer's name and designation of quality.

The public are indebted to the "Lancet" Commission for some most important particulars respecting the adulterations of food, and, in regard to cocoa, we shall take their statement of the extent to which it is done.

With regard to the name cocoa, as meaning a diluted article, we *in toto* object to the idea that it is an adulterated article, any more than a mixture of silk and cotton is an adulterated silk. It is the introduction of a new article, and if the name cocoa is also applied to the nut before

roasting, it is simply a *misnomer*. They are not sold as *genuine* articles; and, as far as powders are concerned, we have most distinctly said that *it is impossible to grind genuine cocoa to a powder*.

"When, however, sophistication is practised upon articles of food, the fraud becomes diabolical and unpardonable; for the addition of chalk, of plaster, of alum, to flour and to bread, of tallow and ochre to chocolate, &c., not only affects the purchaser's pocket but his health."*

To discover this, then, must be an important consideration, both as regards the pocket and the stomach. The Act of Parliament does not fully meet the case, for it is still necessary to obtain a guarantee with any article before the consumer can proceed against the vendor. Dr. Normandy, however, went considerably in advance even of the Act of Parliament. He determined to keep the power in his own hands, and thus avoid the injustice to the public, resulting from the fact that an analysis of a genuine article may be obtained from an analytical chemist, and subsequently placed upon the wrapper of any adulterated or inferior one.

The following is an extract from a letter addressed by him to *The Times*:—

"Howbeit, and in spite of all legislative measures, and of whatever certain persons, from various motives, may say to the contrary, this is certain, namely, that all articles of food in general use are most frequently to be met with in an adulterated state; that genuine bread, in particular, is hardly ever to be found; that the remedies hitherto provided are quite insufficient to arrest, or even to diminish the evil. Any one who could have seen the almost over-

* Normandy's *Commercial Hand Book*. p. 4.

whelming number of letters and of samples of all manner of goods which were forwarded to me during the fortnight that followed my evidence before the Committee, and the earnest requests made by my correspondents to test and analyze their articles, and give them any report thereon, would have thought that the trade had really been maligned, or that if the adulterations denounced before Parliament were considerable, the number of dealers supplying the public with first-rate and pure articles was considerable also; but knowing what an unfair and dishonest use has frequently been made by some tradesmen of scientific reports—knowing how frequently spurious goods have been sold, and still continue to be sold, under the apparent sanction of certain certificates given (I have no doubt) from analysis of genuine articles supplied for the sole purpose of obtaining such documents—I have hit upon the following plan, which I think is calculated to do some good:—To all those, therefore, who had favoured me with samples for analysis, and had requested me to send a report, I wrote that, for the reasons which I have just stated, I had resolved not to grant certificates for publication, however genuine the article supplied might be, unless the person in whose behalf such certificate was written undertook to pay fifty guineas to a charitable institution, should the article so reported on be at *any time afterwards* offered for sale in an adulterated state. I am sorry now to add that, of all my correspondents who so boasted of selling or manufacturing nothing but genuine goods, only two have accepted the stipulated conditions, and I beg to give their names here, which you are at liberty to publish or not as your own discretion may dictate. They are Messrs. Dunn and Hewett, Chocolate Manufacturers, of

9, King's-row, Pentonville, and Mr. Weston, a little Bread Baker, St. Pancras Road.

"In conclusion, I have now to apologise for troubling you with this long letter; but I thought that you would, perhaps, lend again your most powerful aid in giving publicity to the above facts, and to a plan which, if acted upon by other chemists, may give additional value to their reports, test the genuineness of the pretensions of all dealers or manufacturers, and act as a remedy against adulteration, if the public will take the trouble of supporting only those who, being provided with certificates obtained under such conditions, offer a better guarantee of fair dealing than could be secured by any legislative enactment.

"I remain, Sir, your most obedient servant,

"A. NORMANDY.

"67, Judd-street, Brunswick-square, Nov. 2."

The following is the result of the analysis of the *Lancet* Commission:—

"Of 54 samples of different kinds of cocoa and chocolate, eight were genuine. [These eight consisted of flake and rock cocoas, which, as we before said, are the nib simply crushed into a paste.] Sugar was present in forty-three and starch in forty-six. [These are simply the matters as we have shewn which are necessary ingredients in Cocoa.] To such an extent did some of the samples consist of sugar and starch that they contained only cocoa sufficient to impart a flavour to the articles. [To enable the public to judge of this they ought to know the *prices* of the articles; we have shewn that the prime cost of cocoa, *independent of any expense of manufacture*, is 1s. 0¾d. per lb. This, therefore,

must be very extensively diluted to meet the wants of those consumers who will not pay more than from 4d. to 6d. per lb.] Lastly, out of sixty-eight samples of cocoa and chocolate, the ashes of which were submitted to examination, thirty-nine contained coloured earthy substances, as *reddle, Venetian red, umber, &c.*" * "Of the mineral substances for increasing the weight, the chief are carbonate of lime, or chalk, and sulphate of lime, or plaster of Paris."†

This is the most important point, as far as the consumer is concerned, for these articles cannot be taken into the stomach without producing ill effects. The presence of the husk we have seen is also very injurious; and according to the same author chicory is also occasionly added.

In reference to the sugar and arrowroots, Dr. Normandy makes the following remarks :—

"Besides cocoa nuts and sugar, the manufacturer generally adds some arrowroot, many persons preferring the chocolate so prepared, because the oil or butter of cocoa is thereby rendered emulsive and more digestible. The preparation known as *cocoa powder*, or chocolate powder, when genuine, consists only of cocoa nibs, sugar, and arrowroot, mixed and ground together, and then pulverised, by passing the mass through a grating mill, and cooling it." ‡

The following may enable the reader to decide on the question of genuineness, in regard to chocolate :—

"Genuine chocolate (a mixture of cocoa nibs and sugar) should dissolve in the mouth without grittiness; it should leave a peculiar sensation of freshness, and, after boiling it with water, the emulsion should not form a jelly when

* Hassall's *Adulterations Detected*, p. 169. † Ib., p. 179.

‡ *Commercial Hand Book*, p. 178.

cold; if it does, starch or flour is present. The admixture of flour, or of starch, moreover, may be readily detected by the blue colour which is imparted to the decoction after cooling, by solution of iodine.

"*Brick-dust*, plaster, or other *earthy matters*, are detected by incinerating [burning] a given weight of the chocolate or cocoa under examination; the impurities remain among the ashes, and may be easily recognised. This adulteration is also readily detected by grating 500 grains (about 1¼oz.) of the chocolate in as fine a powder as possible, throwing it into about half a pint of cold water, stirring the whole briskly for about ten minutes, leaving it at rest for about two minutes, and pouring off the supernatal liquor. The earthy matter will then have subsided, and will be left as sediment.

"The presence of *animal fats* may be detected by the palate, for the chocolate generally has, in that case, a cheesy flavour; or, when common butter or oil has been added, it has a rancid flavour. This is quite characteristic, for butter of cocoa always remains perfectly sweet." *

If the husks have been ground up, a microscope will readily show the sharp spiculæ of which they are composed. We have added a plate shewing this dangerous adulteration.

Dr. Hassall also gives the following to decide the presence of animal fat:—"If the droplets of fat or oil on the top of the cocoa be firm, shot-like, and globular, except on the upper surface, which is slightly flattened, and very small, rarely exceeding one-twelfth of an inch in diameter, then there is no doubt but that the globules in question consist of the fat or butter of cocoa. If, however, on the other hand, the globules be large, flat, or disc-like, exceed the

* *Commercial Hand Book*, pp. 179, 180.

size named considerably, attaining some of them to one-fourth of an inch or more in diameter, then animal fat or oil is probably present, a conclusion which may be still further confirmed by testing the fat, keeping it for a time, and observing whether it becomes rancid or not."*

Chalk may be detected by adding to a mixture of the cocoa and water a few drops of acid, when, if any effervescence take place, the presence of chalk may be depended upon.

We have already called attention to a large plate exhibiting thirteen kinds of arrowroot or starch used in the dilution of cocoa. The differences between them, when combined with cocoa, can only be discovered by a microscope. It must be borne in mind, however, by the consumer, that, in examining samples to discover the quality of amylum used, it would be as foolish as it would be unjust to the manufacturer, to expect a high class arrowroot in a low priced cocoa.

Cocoa nibs, in their natural and pure state, are of a dull red, or greyish colour, but ladies are too often led by the eye, and prefer any thing that *looks* well and pretty. They seek, therefore, cocoa nibs looking bright and red, which, to their untaught eyes, appear a better quality, while the unprincipled manufacturer or vendor, knowing this, and wishing to "push a trade," at the sacrifice of all principle, goes to some chemist who has more knowledge than justice, and inquires of him how he can make his cocoa nibs look *red*, and better than those usually offered for sale. The chemist tells him that he can effect that object by slightly covering his nibs with Venetian red, which though a poison, will give a very good appearance to his nibs.

* *Adulterations Detected*, p. 180.

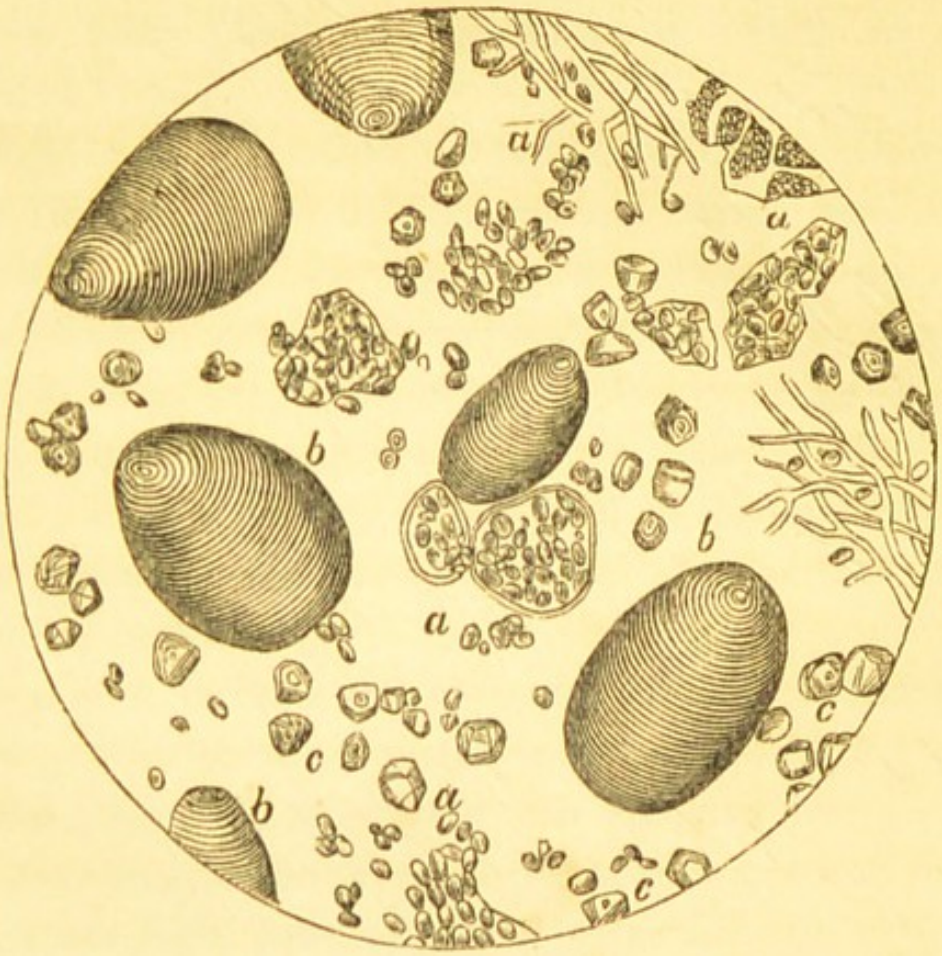


Plate 11.—Adulterated Cocoa, as seen with the microscope magnified 230 diameters. *a a a* Cocoa granules. *b b* Potato starch. *c c* Granules of sago flour.

Here, though the purchaser is the sufferer, it ought to be borne in mind that the penalty is self-imposed, in consequence of studying mere appearance rather than actual quality.

We have added a plate (plate 11), giving the appearance which a sample of adulterated cocoa presented when examined under a microscope, magnifying 230 diameters. It is interesting as showing, that in some of the lower and unscrupulously manufactured kinds, the husk, of which we treated p. 71, is ground up with the cocoa, without the slightest regard for the consumer's health.

SECTION XXI.

ON THE PREPARATION OF CHOCOLATE AND COCOA FOR TABLE.

Having followed the cocoa from the planting of the tree to the conclusion of the process of manufacture, and having given the easiest methods of detecting sophistications by which the public are injured, it now only remains for us to treat of the methods by which it is best prepared for table.

Chocolate cake, being in the form of a paste, requires a different treatment to soluble cocoa, which is in the form of a powder. It is necessary to first take the required quantity of the chocolate, and slice it very finely into a jug. A small portion of sugar is then to be placed upon it, and a little *boiling* water added. This is to be worked up into a *thin smooth paste*, and the cup immediately filled up with boiling water and milk. Should a froth be required, it can readily be produced by the same means that eggs are beaten up. It is then to be served up in a chocolate jug.

Cocoa nibs, and flaked and granulated cocoas require a different treatment, not being ground with a substance which is soluble like sugar. They are prepared for the table by first pouring boiling water upon them, and then allowing the mass to *simmer* from four to six hours. The cocoa must on no account be allowed to boil, for in that case a coagulum will be formed which cannot be dissolved in water. A long continuance of great heat, especially if

the cocoa be allowed to exceed 212°, the point of boiling, an accident occasionally occurring in the process of manufacture, separates the butter from the cocoa, which floats on the surface, leaving only a tasteless residuum.

In the preparation of soluble cocoa much less time is required. Indeed, it may be prepared for the table by simply pouring boiling water over it. The best plan, however, is to put a dessert spoonful of cocoa in a cup, or if a larger quantity is required, at the same rate into a jug, and having placed a lump of sugar in the middle, pour a little *boiling* water and milk upon it; rub it up with a spoon into a smooth paste, and then fill up with boiling water. It is much improved by simmering over the fire for a few moments, and is then ready for table.

SECTION XXII.

COCOA APPLIED TO ARTICLES OF LUXURY.—CHOCOLATE DROPS, STICKS, &c.—USE OF IN TRAVELLING.

Chocolate forming so excellent an article of food, has led to its application in another form, for which also it is eminently qualified, namely, as a sweetmeat. In this form it necessarily ranks far higher than those which consist merely of boiled sugar and flour, being nutritious at the same time that it is most agreeable. Some of the preparations, such as those flavoured with vanilla, those united with cream, &c., are particularly delicious. We have for many years devoted special attention to the manufacture of eating chocolates, which are produced from the finest Caracca nuts, and being perfectly free from all colouring matters, are absolutely safe in use.

In travelling, the Chocolate Sticks are a most convenient refreshment, containing in a very small compass a large amount of nutritious matter. They serve to protect the stomach from the injurious effects of long-continued abstinence; a small cake being amply sufficient for a day.

The delicacy of flavour of these preparations is one of their great recommendations, which places them on a level with any foreign preserves or sweets, at the same time that they are absolutely useful, instead of being, as is too frequently the case with others, injurious to the health. From the care we devote to them, to the selection and

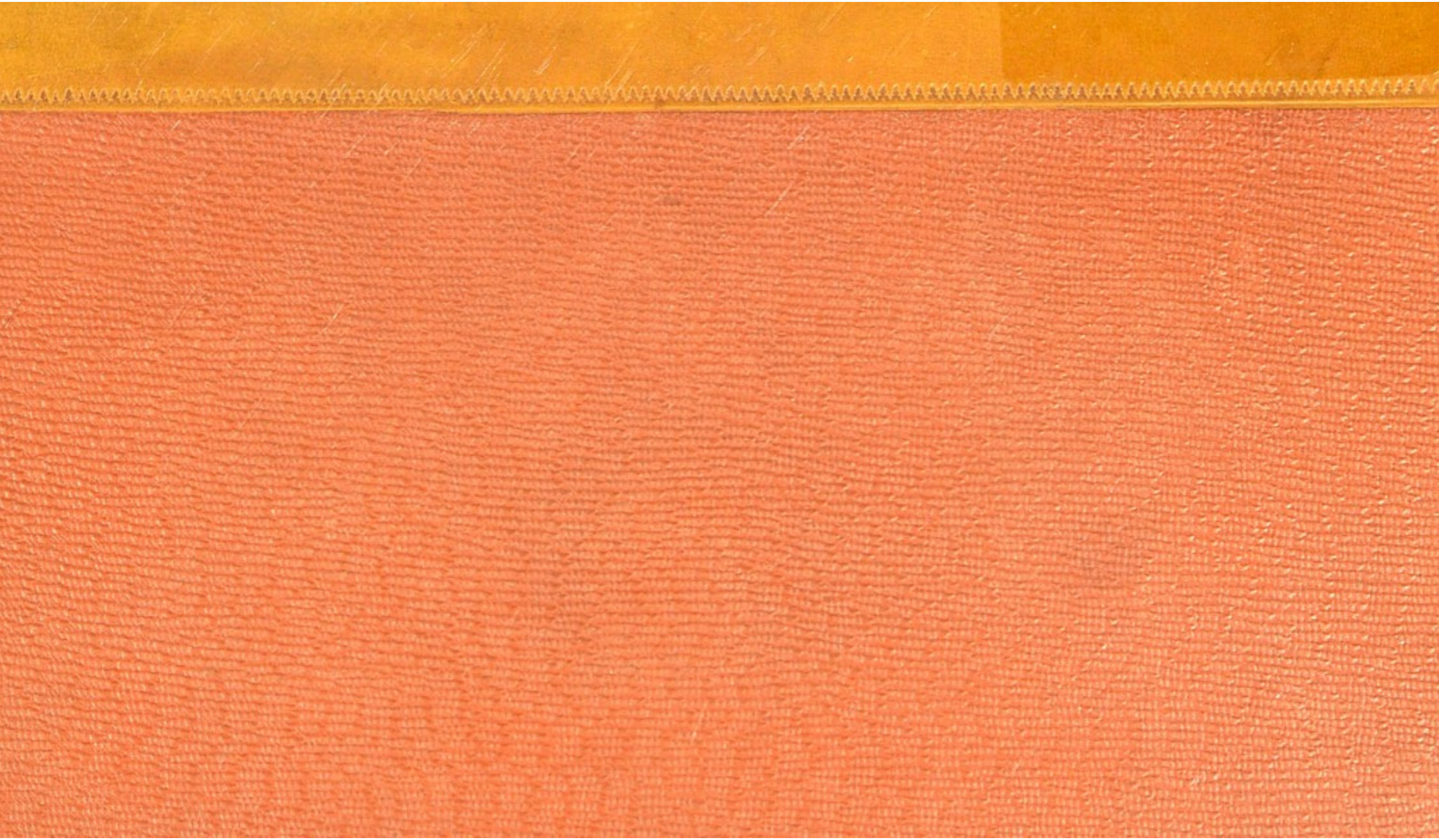
roasting of the nut, and, indeed, throughout the whole process, we can confidently recommend them to our readers.

For children, especially, they are extremely valuable, on account of their freedom from colouring matters, many of which are extremely deleterious. The ill effects which follow too free a use of sugar are also avoided, by the use of this wholesome but delicious substitute.

CONCLUSION.

We have now completed the task we set ourselves, and trust we have been enabled to place before our readers, in a clear light, the economic and dietetic advantages to be derived from the use of cocoa and chocolate. We may be allowed to express, in conclusion, our sincere conviction of the truth of the principles and statements laid down, and at the same time to express a belief and hope that the time is rapidly approaching when the means of the vast masses of the community will be greatly increased by the light which science, properly directed, will be able to throw upon that subject which engrosses the largest portion both of their time and resources. If we have aided, in however slight a degree, in advancing that time, and in spreading juster and sounder views of dietetic knowledge, we shall feel ourselves amply repaid. With these remarks, therefore, commending the subject to your judgment, we bid you farewell.

We take this opportunity of acknowledging the kindness of the proprietors of the "Illustrated London News," to whom we are indebted for Plates 1, 3, 4, 5, supplied to them by a correspondent at Grenada.



24ColorCard CameraTrax.com