

## ON THE EXTRACT OF MEAT

AN article of food has lately been introduced which has found its way into every grocer's and chemist's shop in the country, and for which there is in all parts of the world a vast demand. This substance is variously called the Extract of Meat, the Juice of Flesh, Liebig's Extract, and in Latin, *Extractum Carnis Liebigii*. The name of Baron Liebig, the great chemist, is more especially connected with this compound, as he has undoubtedly the merit of having first called attention to it as a valuable article of diet. In his "Familiar Letters on Chemistry," he devotes a letter to vegetable and animal food, and gives an account of their various chemical components. He shows with regard to all animal flesh, that besides fibrine, albumen, gelatine, and fat, it contains certain other constituents which may be separated from these by a simple process of infusion, straining, and evaporation. The substance thus obtained is the extract of flesh. This compound was known to chemists previous to the researches of Liebig, and he especially mentions those sagacious and experienced physicians, Parmentier and Proust, who had long ago endeavoured to introduce a general use of the extract of meat. They, however, regarded it as a remedy for disease and exhaustion, and recommended it as a resource for the diseased and wounded soldier on the field of battle or in camp. "In the supplies of a body of troops," says Parmentier, "extract of meat would to the severely wounded soldier be a means of invigoration, which with a little wine would instantly restore his powers, exhausted by great loss of blood, and enable him to bear being transported to the nearest field hospital." "We cannot," says Proust, "imagine a more fortunate application. What more invigorating remedy, what more powerfully acting panacea than a genuine extract of meat dissolved in a glass of noble wine? Ought we then to have nothing in our field hospitals for the unfortunate soldier whose fate condemns him to suffer for our benefit the horrors of a long death-struggle amidst snow and the mud of swamps?" That which these sagacious physicians recommended for dying soldiers is now a common article of daily consumption in the households of Europe. That which was amply demonstrated to be of use to the dying soldier, was found no less adapted to restore the vital powers of the poor in our hospitals, and that which proved of benefit to the exhausted nervous powers of the poor was soon found to be of value to the exhausted nervous powers of the rich. The doctor, from prescribing it to the poor in hospitals, learned to prescribe it to his patients among the rich. The result of the action of this substance on exhausted nervous systems and debilitated frames is no delusion, it is no influence of imagination, no simple belief in doses without power, but a real experience which is accumulating from day to day, and making demands on the manufacturers of this all-potent juice, which their utmost industry cannot meet.

Let us now inquire how this is. To the unlearned there is a ready reply: the extract of flesh is all the nutritive power of flesh concentrated, and if one pound of juice is got from thirty pounds of flesh it must be thirty times as nutritious. But it is not so, and it will be surprising to those who believe in this doctrine to hear that the extract

of meat contains little or nothing of what may be said to be nutritious at all. The substances which go to form nourishment for the body, which are contained in meat, are fibrine, albumen, and fat, but these are not present in the extract of meat.

One hundred parts of beef contain the following constituents:—

1. Fibrine	. . . . .	4
2. Albumen	. . . . .	4
3. Gelatine	. . . . .	7
4. Fat	. . . . .	30
5. Mineral matters	. . . . .	5
6. Water	. . . . .	50
		<hr/>
		100

Let us contrast with this the composition of a hundred parts of Liebig's Extract of Meat:—

1. Creatine, Creatinine, Inosic Acid, Osmazome, &c.	. . . . .	51
2. Gelatine	. . . . .	8
3. Albumen	. . . . .	3
4. Mineral matters	. . . . .	21
5. Water	. . . . .	17
		<hr/>
		100

The difference will be seen at a glance. The water has diminished by half, the albumen is less, and there is four times the quantity of mineral matter, and a set of bodies is introduced which occupy half the bulk of the compound, which are not noticed in the composition of beef at all. If, then, the Extract of Meat differs from beef and from all other nutritious articles of diet, it is not in containing nutritious matters, but in containing the chemical compounds just mentioned in large quantities, and mineral matters. It is to these, then, we must look for the explanation of the marvellous powers which the extract of flesh exerts on the human system.

What, then, are the creatine, and its associates creatinine, inosic acid, &c? All we know of creatine is that it is a crystallisable body, and that it has an alkaline action, and is capable of combining with acids to form salts. In this respect it is like quinine, morphine, strychnine, and other substances from the vegetable kingdom capable of exerting a great influence on the nervous system. It seems to stand between these latter bodies and theine, which is contained in tea and coffee, and which has not the power of combining with acids. Whatever may be its chemical character, we know little of its action on the human body. It is easily resolvable into urea, and seems to be one of those compounds which are the result of the decomposition of albumen and fibrine into nerves and muscles before these are ultimately removed from the body. Whatever may be the true chemical or physiological relations of creatine, we cannot but regard the presence of this substance in the extract of flesh as playing an important part in the action of the latter on the human system.

When creatine is boiled with mineral acids another product results, which differs from creatine, and is called creatinine. This again may be decomposed, and forms sarkosine. The special action of these substances on the animal system is unknown, but we know they are con-

tained in the juice of flesh. Besides these substances, there is inosic acid, and inosite, or muscle sugar, found in the juice of flesh, and probably there are other compounds not yet made out, and of whose special action on animal organisms we as yet know nothing. But although our knowledge of the action of these things is very imperfect, there is one thing we know, and that is, that the albumen, the fibrine, the fat, and the gelatine, will none of them act separately or together, as they do when combined with the juice of flesh.

Many experiments have been performed in France, Belgium, and Germany, which show that fibrine alone will not support life, that albumen alone (as in white of eggs) will not support life, that gelatine alone will not support life; we are thus driven to the conclusion, seeing that all these substances are easily digested and appropriated when combined with the juice of flesh, that the alkaline and other substances referred to perform a most important part, if not in ultimate nutrition, at least in the previous process of digesting food.

If we study a little our individual experience in the matter of digestion, we may find perhaps an approximate solution of the mode in which Liebig's Extract acts in giving strength to the weak, and new life to the exhausted. If we are hungry and eat dry bread the appetite soon palls, and we give up the effort; if we take some cold water we can consume more of the bread, and even with warm water, especially if flavoured with tea and sugar, still more. The latter evidently acts as an incentive. If we add salt to the water the same effect is produced. But if we now take a basin of soup—for soup is but a solution of the juice of flesh—we shall find that we can take into our stomachs with relish four or five times the bread we could have eaten dry or with cold water. How is this? We are all aware of the fact without being able to give the explanation. It is evident that an effect has been produced upon the nerves of the stomach and its glandular apparatus, which has enabled it to digest and deal with food which before was a mere inanimate burden in its cavity. If the nervous system is excessively exhausted or unable to act, as it is sometimes in disease, the glass of "noble wine" recommended by Proust will increase the effect upon the paralysed nerves. It is in this way, it appears to me, that the extract of flesh taken with food acts in so beneficial a manner, as compared with tea, coffee, cocoa, beer, wine, or spirits. All these, whilst stimulating the nerves of the stomach to higher action, are attended with subsequent depressing and sedative effects, of which we see no sign in the action of a dilute solution of the juice of flesh.

There does not appear to exist any evidence of the subsequent beneficial action of the organic substances found in the Extract of Meat. Not that this ought to be denied to them. They may, like theine and quinine, supply more readily materials for the manufacture of working muscle and nerve than can be readily obtained otherwise than from the blood. The theory that these salts assist in nourishing the nerves has recently been put forward, with his accustomed ingenuity, by Professor Agassiz; and as the flesh of fish is known to contain more creatine than that of other animals, he recommends a diet of fish as especially adapted for the food of philosophers and those who work much with their brains.

But whatever doubts may arise as to the action of creatine and its consequences on the ultimate nutrition of the nerves and muscles, there can be no doubt of the beneficial action of the mineral matters contained in Liebig's Extract. We eat salt because we do not get enough in our ordinary food. Besides salt, which contains chloride and sodium, we require other elements in our bodies. We require phosphorus, calcium, potassium, sulphur, and iron. Now, we do not add these artificially to our food as we do the chloride of sodium, and yet in our ordinary system of cooking and feeding we may deprive our bodies of these necessary elements. In soup we supply them, and they are contained in the juice of flesh. Whilst one hundred pounds of beef contain five pounds of mineral matters, one hundred pounds of Liebig's Extract contain twenty-one pounds of the same substances. Above seventy per cent. of these consist of phosphorus and potassium, whilst the remainder consists of lime, iron, sulphur, and magnesia. Here then, perhaps, we may find a nutritive action for the Extract in supplying those elements to the nerves and muscles which are constantly being removed by the changes of composition in the tissues, through the vital activity of the body.

From the above statement it will be seen that the juice of flesh presents after its manufacture no new product, but that it contains the same constituents that are ordinarily met with in the flesh of animals. The great advantage that it confers is that it is already fit for use. A teaspoonful of the Extract in a pint of hot water is a stock for any kind of soup, and may be prepared in a few minutes. To this may be added bread, potatoes, vegetables, eggs, meat, or flavouring essences of any kind, and the most agreeable of soups can be thus prepared. Its use in this direction is not confined to the sick-room; it may be used economically for the daily manufacture of soup for the table, and where the speedy preparation of hot food is desirable there is nothing to equal it. For the dyspeptic, and those whose stomachs have become paralysed by the use of theine in tea and coffee, it quickly restores the digestive powers; and for a permanent beverage, morning and evening, it is better than tea or coffee. Of course, this solution should always be taken warm, although after cooling it is perfectly thin, and is not like soup made from meat, which becomes thick on cooling, an effect due to the gelatine, and greasy, from the fat floating on the surface.

The Extract is sold for ten or twelve shillings a pound, and a pound of Extract represents thirty pounds of lean beef. It is therefore no economy to make it and sell it at this price in England; but as it can be made in South America and Australia, where cattle and sheep are in abundance, even at the low price of ten shillings a pound, including carriage, a large profit is made. Within the last few years an establishment has been erected at Frey Bentos, in South America, for the manufacture of this Extract from the wild cattle of that part of the world. There are also two distinct manufactories on the Clarence, New South Wales. These places are worked by companies which supply immense quantities for public use. There are also private manufactories in many parts of America and Europe, and one in Scotland, supplying the same substance. As far as published analyses have gone, the Extract has the same general composition, and

on that account one is not to be preferred above another. But there is a difference in flavour, and that which is preferred in that point will fetch the highest price and have the largest sale. Here, as in all other kinds of food, it is the flavour that makes the quality. It is the *bouquet* of wine and not the alcohol that constitutes its value.

E. LANKESTER

### THE SNAKES OF AUSTRALIA

*The Snakes of Australia: an Illustrated and Descriptive Catalogue of all the known Species.* By Gerard Krefft, F.L.S., C.M.Z.S., &c., &c., Curator and Secretary of the Australian Museum. Large 8vo. pp. 100, with 12 lithographic plates. (Sydney, 1869. London: Trübner and Co.)

WHEN we consider how very small is the number of zoologists who take an interest in, or make a special study of, the animals of the class Reptilia, and how little attraction this branch of zoology appears likely to have for the public, we cannot but feel surprised when, now and then, one bolder than his fellow-labourers prepares a comprehensive account of some portion of these animals, and ventures to put it forth in the shape of a goodly volume, which must have cost the author a vast amount of unappreciated labour, and the publisher a round sum of money without a prospect of its speedy return. Thus, on examining the work which has just been published under the above title by the Curator of the Sydney Museum, we find that the investigations on which it is based have been carried out by fourteen zoologists only, of whom not more than one half belong to the present generation, whilst the other half have only described a species or two incidentally.

The causes of this neglect of the study of reptiles are obvious. In Europe, a boy whom Nature has endowed with a taste for contemplating her works, begins to collect the objects most accessible in his neighbourhood, and most attractive by their variety of form or colour; he collects, and perhaps studies, birds and their eggs, beetles, butterflies, shells, or plants. What is more natural than that he should continue to devote himself to the same particular branch, if the duties of more mature years allow him to develop the fancy of his boyhood into scientific research? Consequently, ornithology, entomology, conchology, and botany are *popular* pursuits.

There are but few who become connected with public collections, and who, from more expanded views or duty, enter into the study of animals which have but rarely formed part of private collections. A boy in England would soon get tired of his taste for natural history, if he had to develop it through the scanty means afforded by the small number of British reptiles; and Ireland, as far as we are aware, has not yet produced a single herpetologist (although, as Mr. Krefft informs us, that island is inhabited by snakes—a fact which is certainly new to us).

On the other hand, we may predict that herpetology will become a more popular science in Australia, where reptilian life abounds. Snakes must be numerous there, for we are told that, "from six to ten specimens, belonging

to different species, were captured some years ago under a single stone not many miles from the city of Sydney;" that, "to go snake-hunting has been a pastime with school-boys for years," and that "the collecting-bag often forms part of the outfit of the wallaby-hunters, by whom the old sport of boyhood is not forgotten." Snakes in Australia must also play quite as important a part in relation to mankind as in tropical countries; for not less than two-thirds of the species, and fully nine-tenths of the individuals, are venomous. Ten years ago only some forty species of Australian snakes were known; and it is chiefly due to the energy of Mr. Krefft, as collector and curator of the Australian Museum, that this number is now doubled.

The work begins with a copious introduction, in which the natural history of snakes generally is treated in a popular manner; then follow technical descriptions of the eighty species known, and their geographical distribution and habits are indicated, the volume being illustrated by twelve lithographic plates. The descriptions are chiefly reproductions of the original diagnoses given by the various authors; and we do not notice any species which has not been described elsewhere. Thus, whilst we bear witness to the great progress in Australian herpetology due to Mr. Krefft's labours, we must add that he has effected it previously to and independently of the publication of his book. But, like all conscientious compilations, it will be useful to the student, and will supply a real want among residents in Australia desirous of acquainting themselves with objects which daily come under their notice.

Great credit is likewise due to Mr. Krefft for the caution used in working up his materials. European collections contain by far the greatest number of the typical specimens of the species described within the last century; and men working at a distance from this principal source of information, and more or less dependent on descriptions, are only too much exposed to the risk of failing in the determination of species, applying old names to really new species, and describing old ones as new. No end of labour in rectifying these errors is caused to European naturalists by such premature publications. But Mr. Krefft has been for years in constant communication with his fellow-labourers in England and Germany, sending duplicate examples for identification; and thus creating a well-determined collection, he has laid a solid basis for his own future researches and for the instruction of Australian students. We have heard an authority on the subject express the belief that there is not in the book a single species erroneously determined.

The plates which accompany the volume are the work of two ladies, Miss Scott and Mrs. Edward Ford, who, considering the peculiar difficulty of drawing snakes, have accomplished their task extremely well.

In conclusion, we must congratulate the trustees of the Sydney Museum on having found so able and zealous a curator as Mr. Krefft; and express the hope that his book may lead to new discoveries sufficiently numerous to call for a second edition. It is a good sign that the scientific literature of our colonies already contains such books as the one under review. May the number soon be largely increased.

A. GUNTHER